The Chemical Age

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Notes and Comments

A Happy Event

THE articles which we have commenced publishing upon the economics of the synthetic production of ammonia will interest students of chemical engineering. In addition they may well prove to be of inestimable value to all engaged in the profession of chemical engineering in giving an actual example of the type of report, complete with costs and quantities, upon which the prospects of installing one of the known synthetic processes depend. Incidentally, this report shows the dependence of the production of synthetic ammonia upon the cost of power. At the date of its compilation the cost of power from water at the cheapest Norwegian rate was 0.03d. per kWh as compared with an assumed cost in England from coal of 0.108 to 0.2d. The problem largely resolved itself into whether with the much higher English power costs there was any likelihood of producing ammonia by any of the recognised methods at a competitive figure.

The Arc Process had to be abandoned quite early because it can only be considered where very cheap power is available, since only 3 to 4 per cent. of the power supplied is utilised on account of the inefficiency of the process. The fuel requirements of the several processes per ton of nitrogen as sulphate of ammonia, are given as 53 tons for the Arc Process; 17 tons for the Cyanamide Process; 6.5 tons for the Haber Process and only 2.8 tons for natural nitrate. The establishment of the synthetic ammonia industry has, of course, virtually driven by-product ammonia off the coal-by-product tree; such plants as still produce it commercially do so primarily because they must and not because the profits are considerable.

The power cost relative to the total cost is so very much less for the Haber Process than for the other processes, that this factor alone may have been sufficient to decide the issue. In the report the best power cost from coal has been taken as 0.108d. per kWh, but this figure appears to be optimistic. About the time when the report was written Sir Alexander Gibb indicated that the more usual figure was of the order of 0.2d. per unit and would not, in any event, be expected to be below 0.16d. per unit. In the cheap power countries of that day figures of the order of the 0.03d. used in the report were found, but cannot now be repeated in new installations because of the increased capital costs. The problem of cheap power for chemical industry was further discussed when the Severn Barage Committee reported in 1933, but without showing much likelihood of coming anywhere near 0.1d. per unit in this country. It may be remarked while upon this question of power, and as a hint to the chemical industry, that if industries could use off-peak power and so assist the grid stations to make their load more uniform, far cheaper current might be secured than is possible under usual conditions. The conclusion reached in the report which forms the subject of our new feature is that the Arc Process was right out of court because of the power cost; that the Cyanamide Process was better was still impossible in this country; but that the Haber Process would compete with imported Chile nitrate and with other fixation processes using cheap water power.

Danger in Sodium Chlorate

A CORRESPONDENT in Wellington, New Zealand, writes to challenge a statement which appeared in THE CHEMICAL AGE report of the British Industries Fair last February to the effect that the efficiency and *safety* of sodium chlorate would be big factors in causing an increase in its popularity with the amateur gardener. Experience in New Zealand with sodium chlorate has been of rather an unfortunate nature in that several farmers and farm workers have lost their lives owing to the explosive and inflammable nature of this material, and our correspondent suggests that every effort should be made to prevent its use spreading into the hands of the amateur gardener as careless handling is liable to cause a great deal of trouble. An undesirable feature which will probably follow will be the mixing of sodium chlorate with fertilisers, a process that has already been advocated in New Zealand. Its nature more or less condemns its use for weed killing purposes except under conditions of strict supervision, and this cannot always be obtained on a farm or in a garden.

In spite of warnings issued by the New Zealand Department of Agriculture regarding precautions that are necessary in handling sodium chlorate several fatal accidents have occurred and many accidents of a less serious nature have been reported. Prosecutions carrying heavy penalties have also been made in order to curb the use of sodium chlorate in admixture with sugar and sulphur in home-made explosives for blasting work on the farm. Bulletin No. 158, issued by the New Zealand Department of Agriculture, states that the method most generally adopted in New Zealand for exterminating weeds by means of sodium chlorate is that of spraying the chlorate dissolved in water on the plants. In doing this the solution is apt to become split or sprayed on to the worker's clothing, impregnating the cloth with chlorate. The water rapidly evaporates, leaving the chlorate distributed with the fibres of the cloth and in the closest contact. The dry

clothing is now liable to burst into flames with great rapidity so soon as a spark, a blow, or friction is applied at any one spot. Heating the clothing by coming too near a fire and without actual contact with a spark or flame or heating by friction or by concussion from a sudden blow, may also cause a garment to take fire or even to explode. In fact, the person with clothing contaminated by chlorate resembles a human match of which the chlorated spot is the match-head. The danger that saturated clothing when dry may become an explosive mixture also increases the risk of fire, while contributing an added menace from the shock of explosion or detonation.

Safety Precautions

THE Bulletin to which we have already referred, in summarising the points necessary to be observed in order to prevent accidents, states that sodium chlorate has, within recent years, been found to be so effective as a weed-killer that great quantities will probably be used in the near future. Sodium chlorate when mixed with combustible substances has the unusual property of making them so much more inflammable that these substances burst into flames or explode on contact with a spark or when heated, or by a sudden blow or by friction in the same way as a match is ignited. As accidents resulting in the destruction of life and property have happened as the result of careless handling of sodium chlorate it should not be allowed to come into contact with ordinary clothes, woodwork, sacking, dry fodder, sulphur, powder dips, or any other combustible substances; it should also be kept stored in the original iron containers, and only mixed and transported in metal, giass, porcelain, or enamelled vessels, which must afterwards be thoroughly washed out with water.

It is necessary that the clothing worn by workers when using chlorate be of waterproof material, with gum boots, which can be easily and quickly washed free from any chlorate after spraying is finished for the day. Similarly all wooden portions of implements used in handling the sodium chlorate or solution should be kept waterproof by paint in order to facilitate washing down with water. It is an offence against the New Zealand Explosives Act to mix chlorates with other substances with the intention of making an explosive. It is an offence against the New Zealand Postal Regulations to send a dangerous substance through the mails, the penalty being two years' imprisonment or a fine of £50, or both. Sodium chlorate is accepted for transport by the New Zealand railways when in the original drums, or in smaller quantities when securely packed in tinned iron containers, the stationmaster then supplying a receptacle used for the carriage of dangerous goods.

New Inorganic Compounds

THE production of new compounds seems to be the present aim of the inorganic chemist. A recent review of "the important discoveries of the past few years" is largely concerned with new compounds the preparation of which has hitherto eluded the most cunning investigator, the value of which in view of their instability, is likely to be negligible. Amongst these compounds have been sulphur monoxide, SO; two fluorine oxides, F_2O_2 and F_2O—the latter differing from F_2O_2 by being stable above $-100°$ C! There are also two oxides of bromine, Br_3O_8 and Br_2O. These all belong to the category of compounds that might have been expected to exist if one could but make the reaction take place under conditions when they were stable for a sufficiently long period of time to enable the experimenter to recognise them. On the other hand, come compounds of the type SO_4 and NO_3, HNO and number of interhalogen compounds, many of which are characterised by the ability of many atoms of fluorine to combine with a single atom of the other halogens. This property of fluorine is also demonstrated by such compounds as S_2F_{10}.

No doubt the discovery of the possibilities of intercombination "gives a great stimulous to theories of valency," but it seems probable that theories of valency are just a little unnecessary. One day, chemists and physicists will realise that there is no essential difference between their sciences. The causes of the electrical, magnetic, polarisation and other effects studied by the physicist lie deep in the molecule; so also do the causes of chemical combination. Theories of valency which fail to take into account the structure of the atom must fail to be permanent. Should we be very far out if we suggested that the trend of recent work, though it has not yet advanced so far, is to suggest that *given the correct conditions* every atom can combine with every other atom? The correct conditions may never be within our power to reproduce, because of the inherent instability of the compound formed; the life of the compound under all but the perfect conditions may be 10^{-x} seconds where x approaches infinity. Nevertheless since all matter appears to be built up from the same basic substance, it is unlikely that the suggestion here made is incorrect.

Loans for Small Businesses

THE problem of financing small businesses has occupied the attention of the financial world during recent months. We have given it some notice in these columns, because although the tendency to-day is in the direction of bigger units, there are many businesses, even in the chemical industry, which involve the development of new products and which can be carried on in the earlier stages better by a small group of enthusiastic specialists than by the large organisation that thinks in millions. A month ago we recorded an authoritative refutation of the popular conception of a strangle-hold by the joint stock banks upon small businesses, a refutation which destroys much of the case made out by certain politicians for the nationalisation of banking. The case for the banks has now been taken a stage farther by Mr. Gibson Jarvie, who believes that it is not a question of adequate finance and credit not being available, but that there are not enough credit-worthy people seeking finance and willing to use it. In other words, the banks will finance everybody worthy of financing. But who is to say whether a given concern is worthy of financing or no? The answer can only be that the banks themselves must do it. They, however, are naturally conservative and have no expert knowledge of many of the newer businesses which it is proposed to establish; consequently they necessarily fall back upon the good old principle of "cover." Any individual can get a loan from his bank if he provides more than adequate "cover" for the loan. Banking has not advanced from this position appreciably and we should be sorry to see it do so.

To-Day's "Skeptical Chymist"

Presidential Address to the Oil and Colour Chemists' Association

MEMBERS of the Oil and Colour Chemists' Association assembled for the first meeting of their 1935-36 session at the Palace Hotel, Bloomsbury Street, London, on October 3. Immediately following an informal dinner, a presentation was made by Mr. Noel Heaton, a past-president, on behalf of the Council, to Mr. Forrest Scott, in recognition of his services to the Association as hon. secretary, from which office he has recently retired. The presentation took the form of a gold cigarette case, suitably engraved.

Presidential Address

Mr. G. A. Campbell delivered his presidential address, under the title of "To-day's 'Skeptical Chymist'," in which he departed from custom by deserting the study of chemistry in order to study chemists themselves—their preparation, relationships, organisations and outlook. Thus he suggested a pause amid the tremendous accumulation of knowledge which was proceeding throughout the world in laboratories, men's minds and that unwieldy and unyielding literature which preserved, and buried, its most fertile facts, and he considered its reaction on the chemist himself. It did not follow necessarily, he said, that because a certain condition of things had developed naturally and a system of a certain kind had been evolved, it must inevitably be a good system. Whilst the subject had a general application, Mr. Campbell dealt more particularly with the chemist in the oil and colour industries.

Dealing first with education, he said the young chemist entering industry from a university or continuation school merited sympathy, but seldom received it. He had to carry a tremendous amount of luggage in his portmanteau of knowledge, so much so that unless his head be swollen he could scarce contain that knowledge. Theories, also, many of them conflicting and only half expressed, had entered the text-books and claimed so much of memory that the student had little brain left to appraise their relative value and to puzzle out their consequences. There had been developed a feeling of indefiniteness and vagueness in chemistry which did not exist 25 years ago, when atoms were still atoms and the elements "stayed put." The young man entering the oil and colour industries should retain his new-fangled ideas in the background, using them as a measure against which to compare his day-to-day experiences.

Ideal Training for the Paint Chemist

Mr. Campbell considered a university degree course to be the best possible preparation for paint chemists, though he admitted that some of the most successful chemists of the industry were men who had graduated through the works. Men who had graduated in this school, however, if they were up-to-date with their knowledge, must be natural students and must have studied at home. The works course was best for them, but for the ordinary being it was too exacting and left the fundamentals too much to take care of themselves. Mr. Campbell's ideal would be a two-year course at a university, comprising pure chemistry—inorganic, organic and physical—with plenty of practical work in each; then a year in a works, and, finally, a year or two at a university course akin to a final year's honours course. The early contact with the works would act as an incentive and directing force in the subsequent years of study. It would mean much closer co-operation between university and industry. Some scientific society in each industry, such as the Oil and Colour Chemists' Association, could set up machinery and act as a clearing house, to register students and put them in touch with firms at the appropriate period of their training. The year in the works would be a year of paid work, where the student became a part of the organisation of the works or laboratory, not a supernumerary stranger, unpaid, such as the present-day vacation worker.

This procedure would mean a revision of degrees courses at British universities; but, after all, technological degrees need not be planned on identical lines with the leisurely, cultural courses of the older universities, for the former were utilitarian. The first two years of pure chemistry might correspond with an Intermediate B.Sc. As a corrollary, it would also do university lecturers good to talk to men who came to them after works experience, which ripened the judgment. Something very like this ideal already existed in America in connection with the motor and electrical industries, and it worked very well. University courses, however, were not yet the privilege of all who could benefit by them. One of the most encouraging signs of the post-war youth was his eagerness in attending continuation classes; and it was peculiar that an age which limited the hours of work for adults, and catered for "tired business men," regarded as normal a position where youths in industry spent three and four nights a week studying the science of their jobs, and doing homework and study in their spare time.

Having completed his years of prescribed study, the chemist within the industry was at liberty to commence his education. The profession was a hard task-master and brooked no denial. He must scorn delights and live laborious days—not in order that he might surpass his fellows in his knowledge—but in keeping up-to-date with his subject. The charm of chemistry lay in the perpetual challenge which urged a man to give of his best in serving the science of his choice. As to relationship with other chemists, it was a commonplace that chemists were bound to gain tremendously by mixing together in an informal way and discussing problems of mutual interest. The new synthetic resin industries—plastics—for instance, had made phenomenal progress, and believed in the policy of the open door and the open book; that industry had progress in the hands of chemists. The specialist society served here; the Oil and Colour Chemists' Association served the double purpose of directing further studies in presenting papers and discussion, and of directing the relationship to other chemists. It was equally important that the chemist should occasionally meet the chemists of other industries, from whom much could be learned. For example, the pigment trade had learned much of its methods of elutriation from the agricultural chemist and the ceramic chemist; much of their methods of testing fineness had been learned from the engineers and mining chemists.

Coming to the relationship with other members of the industry, Mr. Campbell pointed out that the commercial man, however far removed from technical matters in everyday affairs, still had his roots in the technical side, and should obtain his inspiration from it. This was a matter of particular importance in the Oil and Colour Chemists' Association, for with it was incorporated the Paint and Varnish Society, a body, not of chemists, but of craftsmen. They were keenly interested in their job and had decided to compare notes to mutual advantage. After the war they had looked to the oil and colour chemists for guidance, which was just as it should be, and the blend had been a happy one. The membership of the Association comprised the chemists, craftsmen and commercial men in the industries.

Industrial Organisation and Society

The "skeptical chymist" might also inquire about his relationship to industrial organisation and society—the feeling that chemists deserved better of the world than was evidenced by their usual rewards, either tangible or in social standing. The chemist had given much to the world, in common with the physicist and the engineer. Until now the scientists had simply delivered the goods, but had left it to the world to say how best to use them. It was time the scientist took more interest and more share in the work of management within his own industry and in the using industries. Why did so many works managers in the chemical industries graduate through the engineering shop rather than the chemical laboratory? No matter what the managerial post in the chemical industries—whether buying, costing or sales management—they were all better done with the aid of a background of sound chemical knowledge and the experience of hard facts, as distinct from hard figures.

As to relationships among chemical associations, Mr. Campbell urged that the movements among the larger chemical

societies rendered the position well worthy of study to the active observer. There appeared a vast accumulation of chemical associations and societies. Leaving apart the Royal Society as being in a category of its own—the oldest in the world and the most general—Mr. Campbell pointed out that the Royal Society of Arts was the forerunner of all scientific and technical societies. Most of them could, if they would, trace their inspiration to it, and many owed their inception to its activities. He made brief reference to the formation of that Society in 1754, and the formation of its Chemical Section in 1874, and traced the subsequent process of decentralisation and the formation and activities of the Institute of Chemistry, the Society of Chemical Industry and the Chemical Society.

Contact with Industry

Chemistry, continued Mr. Campbell, had ceased to be uniform and simple and detached, and it required contact with industry and with other professional bodies. There were, he said, many years of solid achievement behind the "big three"; their coming together for the purpose of co-operating even on a limited scale was an event of first-rate importance in the chemists' world, and one which demanded study by all members of specialist associations. The existing agreement was a very mild form of co-operation, consisting essentially in the establishing of a fund and of a Chemical Council to administer the fund. The first claim upon the fund would be the Chemical Library, which, though still remaining the property of the Chemical Society, would be a joint responsibility as to upkeep and expansion, responsibility being based upon membership. The fund might also meet other charitable outlays in the interests of chemistry—the co-ordination of publications being one of them. The process of decentralisation was momentarily arrested, and a restricted central Chemical Council was established to look around for seven years to see if aught could be achieved.

Meanwhile the process of decentralisation had gone further, for specialist societies had sprung up in many industries. It might be thought at first sight that these smaller societies had little or nothing to do with the developments already mentioned—that the big three were simply arranging their own affairs on a more systematic basis and that there was nothing else in it. But things were not so simple! The chemist was realising his responsibility to society. Too long he had looked at his manufacturing plant and his laboratory and had let the world go by. He was widening his outlook, and wanted a coherent and powerful voice in affairs. The "get together" of the "big three" was one tangible sign, having behind it a membership of some 15,000; outside, as yet, there was the great membership of the specialist bodies, at least 10,000. It behoved the smaller societies to take notice—not as a measure of defence, for there was yet no effort to influence—but as a sincere effort to find out what steps were necessary, first to dignify the profession of chemistry, and secondly, to promote the specialised interests of the industry they themselves served.

Ideal Co-operation

There was no need to reason that there was great difficulty in the ideal co-operation in these circumstances, though it would be probably on a different basis from that in America, where the American Chemical Society was the controlling body and every specialist industry was catered for by a section of that parent body. In Great Britain the specialist society was a small detached unit, independent in outlook and action; any moves towards centralisation of the chemical and technical societies must accept the historical background of the present specialist societies and respect their individuality. To leave the specialist societies to develop along their own particular lines for the benefit of the industries they served, with the inspiration and incentive of their own initiative, and still obtain a degree of co-operation to speak with one voice when required, was an ideal worth striving for. At present many tongues and many voices were speaking for chemistry and science. It was the Federal Council for Chemistry—a composite body, having representatives from many other societies, which did much consultation work that drew together associations having a common interest—which had played the big part in the move towards greater co-operation. One presumed that in time the Chemical Council would take over the duties of the Federal Council and form another landmark in the progress of chemical organisation.

Further reference was made to the various bodies having an influence upon co-ordination of work—the British Science Guild, the Federal Council for Chemistry, the British Association and the Royal Society—and particularly to the Royal Society of Arts, as a co-ordinating force among chemical organisations, though, said Mr. Campbell, it would be too much to expect the prodigal sons to return to the old home. One felt at times as one grappled with the terrifying literature of the day, that there was little need nowadays to strive for the promotion of chemical investigations; they moved so easily from their own momentum. What was needed was the human mind and the human wit to apply the gifts of science and chemistry. It might be a goodly thing for chemistry to strengthen this bond with the arts in this old organisation—to further the "art in industry" movement and develop the broader sympathies which contact with the arts fostered.

In professional circles the Institute of Chemistry might claim the voice of authority. More and more it was recognised as a qualifying body, and as a disciplinary body in Government circles, and the recent Poisons Manufactures Bill showed influence also in manufacturing chemistry. It spoke well of the broadmindedness of the Institute that it was prepared to modify this bold individual growing hold in order to obtain a better representation for the whole body of professional and industrial chemists.

Mr. Campbell mentioned also the growth, in the provinces, of efforts to co-ordinate local affairs among chemical organisations and prevent overlapping of local lectures, economising on the publications of the annual syllabus and arranging joint meetings. All these activities, however, indicated a feeling among the rank and file that some measure of co-ordination was desirable to curtail the number of meetings, to arrange for border-line subjects to be discussed at joint meetings, and, above all, to economise on secretarial work and stationery and publications, so that eventually there might be reduced composite subscriptions. It would be good also to have a single body which could administer funds for the common good and speak authoritatively for chemical opinion, after consultation with its associated bodies. The scheme of the "big three" was based on a seven years experimental period. Mr. Campbell expressed the hope that this did not mean that the ideal of a great Chemistry House—or the bigger project of a House of Science—was to be shelved for seven years.

South African Chemical Notes

Crude Oil from Torbanite

According to a recent report from the South African Torbanite Mining and Refining Co., satisfactory progress has been made in the extensive construction work at Ermelo, Boksburg and Durban. The torbanite is being mined at Ermelo, where the retorting plant is nearing completion. The refinery is being erected at Boksburg, and at these two places employment will be given to 700 Europeans and natives. It is anticipated that in October or November the refinery will be producing petrol from crude oil, and it is also hoped to produce a South African crude oil commercially at Ermelo. Crude oil will be imported through Durban and sent to the Transvaal for further treatment. Arrangements for marketing the company's products have been completed.

Manufacture of Cyanide

There is a possibility of a plant being established in the Union for the manufacture of cyanide, following the visit of the executives of a large American company. Much of the cyanide at present used in South Africa is shipped from a Canadian plant. If the American company enters the South African manufacturing field, increased competition in the sale of chemicals to the Rand mines will follow.

Meat and Fish Canning

It is proposed that a beef canning factory be established in the Pietersburg (Transvaal) area, and by the optimistic attitude of the cattle farmers and the Chamber of Commerce it seems that there is a strong likelihood of the proposal being put into effect. The first step will be the provision of abattoir facilities. It is also anticipated that South Africa may find a renumerative market for crayfish tails in the United States. Up to 1933 fully two-thirds of an output valued at £257,317 went to Paris. If this industry revives work will be found for about 1,000 hands, earning about £50,000 in wages and with an output worth about £350,000.

The British Fuel Policy

Sir John Cadman's Presidential Address to the Institute of Fuel

IN the course of his presidential address to the Institute of Fuel, in London, on October 9, Sir John Cadman, D.Sc., the president-elect, considered the position of coal and oil in our national economy and how they have been aided or hampered by various developments which have occurred since the war.

Great Britain, said Sir John, depends for the production of power, heat and light upon two fuels—coal and oil. The former is indigenous and is our traditional national fuel. The latter is to a great extent imported from abroad. It is also relatively new as a source of energy. Within recent years the output of British coal has declined. In 1913, the year of peak production, 287 million tons of coal were mined. Production since the war has been as follows:—1922, 250 million tons; 1926 (general strike), 126 tons; 1930, 244 million tons; 1934, 221 million tons. Reduced output is, of course, the consequence of reduced demand and is not in any way symptomatic of failing resources.

Reduced Demand for Coal

Demand for British coal is divisible, in the first place, into quantities required for export and quantities consumed at home. In 1913, the equivalent of 98.3 million tons of coal were shipped abroad either as exports or as bunkers for vessels engaged in foreign trade. In 1934, the aggregate of exports amounted to 57.1 million tons—a decrease over the period of 41.2 million tons. Home consumption of coal has also declined, the respective figures for 1913 and 1934 being 183.9 million and 161.5 million tons—a decrease of 22.4 million tons. It is significant that on the larger total of home consumption as compared with exports the decline should be smaller both as a net figure and as a proportion.

Various factors have contributed to bring about the great reduction in demand for British coal between 1913 and the present time. The war stimulated many nations—neutral as well as belligerent—to rely more fully upon their own resources of raw materials rather than to place their trust in possibly cheaper imports which, in the event of another war, might again be subject to violent dislocation, if not to abrupt termination. The development of foreign coal mines is a case in point. To the extent that any country formerly dependent upon imports of coal has replaced those imports by indigenous production, the trade of the coal-exporting countries has necessarily suffered diminishment. Great Britain, being one of the exporters, has participated in the decline. Another contributory cause in the reduction of British exports of coal is the increased activity in world markets of other exporting countries. Polish and German coal, for example, is now exported in considerably greater quantities than was formerly the case.

Nationalistic Economies

Included in the figures of exports, the quantities of 21 million tons in 1913 and 13.5 million tons in 1934 represent the amounts of British coal consumed as bunkers in ocean-going vessels. Those figures show a drop of 7.5 million tons during the period of 21 years. A great proportion of that decrease is due to the replacement of coal by oil as fuel for ships. A drop of 7.5 million tons in the annual demand for coal is, of course, an important loss to the British coal industry. Nevertheless, its importance should not be exaggerated; 7.5 million tons is only about 18 per cent. of the aggregate fall in British exports of coal during 21 years.

Although the reduction of our exports is due to a large extent to "nationalistic economics," and although the decline in quantities shipped as bunkers has a root cause in the increased use of oil as fuel, there is a further cause which affects exports, bunkers and home consumption alike. Since 1913, and more particularly in the years which have elapsed since the war, questions of fuel economy have received ever-increasing attention from engineers and consumers. At the present time our home consumption of fuel is approximately equal to the figure at which it stood during the period 1895-99, despite the fact that industrial power equipment has since been approximately trebled and the population has been increased by about 10 millions. It is evident from these facts that considerably less coal is now required for producing a given quantity of power, heat or light; and since fuel economy is practised in all countries in connection with virtually every form of coal consumption, its aggregate effect upon demand for coal must be a considerable factor in annual output. It has, indeed, been estimated that in comparison with 1920 fuel economy in Great Britain has been responsible for a reduction in British annual consumption of approximately 25 million tons.

The rise in the consumption of oil in this country since 1913 is shown by the following figures:—

Year,	Motor spirit. 1,000's of tons.	Fuel oil, gas oil, diesel oil (incl. bunkers). 1,000's of tons.	Total (all products). 1,000's of tons.
1913	360	600	1,800
1922	1,067	1,207	3,241
1926	2,136	2,362	5,674
1930	3,432	2,184	6,881
1934	4,178	2,884	8,436

In 1932, although 1.33 million tons of fuel oils were consumed within this country, 150 million tons of coal also were consumed. Weight for weight, therefore, fuel oil provided 0.88 per cent. of the aggregate quantity of coal and oil consumed in this country. In 1933 and 1934 the percentages were respectively 0.93 and 0.90. The direct displacement of coal by fuel oil within this country cannot be regarded as gravely injurious, since in each of the three years fuel oil provided less than 1 per cent. of our fuel consumption. Another figure concerns the home production of liquid fuels from shale and coal: in 1934, the quantity of oil and creosote (some of which is consumed as fuel) obtained from indigenous sources amounted to about 600,000 tons.

A Deplorable Loss of Trade

Those are the facts of British production, consumption and export of coal; and of British production, importation and consumption of oil. They record a deplorable loss of trade in coal, accompanied by diminished output, unemployment and, to some extent, unprofitable operation. As regards oil, the facts are that consumption has been continually on the up-grade. Oil-consuming vehicles and plant have steadily increased in numbers; and, in consequence—since we have found no natural petroleum within our shores and do not produce much oil from indigenous sources—imports of oil have increased correspondingly.

From the point of view of national economy it is highly regrettable that any great industry—such as coal—should fall from its high estate. It is regrettable also to note—as we are compelled to note—that there is little probability, in circumstances which we can envisage, that the statistical position of the coal industry will, in the near future, regain its former high level. Nevertheless, it must be remembered that the national industry of a country such as Great Britain is the aggregate of many industries. We are not dependent solely upon coal for our welfare. During the period which has witnessed the decline of coal, new industries such as those concerned with motor transport, aviation, wireless, rayon and petroleum have arisen. On balance and making allowance for the temporary effects of depression, the industry of the nation has increased in volume. Industry is dynamic, not static; and a state of flux combined with increasing aggregate volume is a sign of virility in the industrial body as a whole. However that may be from the national point of view, we must admit that it is of little consolation to those directly concerned with coal. Moreover, since coal is one of our greatest industries, its reduced importance is naturally a source of concern to the Government of the country. Similarly, the increased operations of the oil industry within Great Britain—if they are not a " concern," in the disturbing sense of that word, of Governments—have, as we are well aware, been remarked and utilised by successive Chancellors of the Exchequer.

It is by examining the developments in the industries and the manner in which successive Governments have treated

coal and oil that we are best able to obtain a comprehensive view of British fuel policy. In 1920 the coal industry was still under the system of complete State control instituted for war purposes early in 1917. Until the autumn of 1920 its prosperity continued unabated. The troubles of 1919, which led to the appointment of the Sankey Commission, were not due to the miners' resistance to the results of any depression, but to their desire for a greater share of an abounding prosperity. The results of the Sankey Commission were the enactment of a seven-hour day and a general increase in wages. By a further Act in 1920 the Mines Department was created, and power was taken to obtain the statistics which are still published. This Act had no special political significance, except that, when passed, it was taken in some quarters to be the beginning of a permanent system of nationalisation. The same Act imposed a levy of 1d. a ton on output in order to provide the Miners' Welfare Fund, which has done since much useful work.

The Attitude of the Government

It is important to note that the period of nationalisation is thus associated by the miners with a prosperity never experienced before or since. This prosperity was purely fortuitous, being due in the first place to the unlimited demand for coal (coupled with the shortage of labour) during the war and an equally unlimited demand immediately after the war from a world trying to re-stock itself with goods and to repair damages. But the period of nationalisation was in reality disastrous. Little development work was done. The mines were skimmed of their best, and the condition of the industry by 1920 was economically unsound. Already during 1920, domestic demand fell off, and a loss was being made on the sale of coal at home. But this loss was concealed for a time by the enormous profits still made on exports. Foreign consumers, however, were antagonised by this shameless exploitation, and a strong prejudice against British coal was created abroad. Early in 1921 the export market also showed signs of collapse; and it became clear that the system of control would mean a loss to the Government of many millions a year. The Government, however, could not face the odium of having to impose drastic wage cuts; and the industry was decontrolled at six weeks' notice.

From 1921 until April, 1928, the Governmental attitude towards oil was one of non-interference. The industry and consumers of its products were allowed free play in almost all their activities, provided the public safety was not endangered by such risks as fire. On April 25, 1928, however, a duty of 4d. per gallon was imposed upon imported motor spirit. This was the first tax to be imposed since the emergency measures of the war, which were discontinued in 1920.

The next stage in Governmental policy towards the oil industry was reached in April, 1931, when the Chancellor of the Exchequer—Mr. Snowden—imposed a further tax of 2d. per gallon on motor spirit. Mr. Snowden imposed the tax reluctantly: "I have never liked the oil duty," he said. "I withdraw nothing that I have said about this duty, but I find the tax in existence and fruitful in its yield, and the stern necessity of the present emergency, and that alone, compels me to make use of it for the time being."

The Duty on Motor Spirit

The next feature of our survey of Governmental policy towards oil presents itself within a lapse of only five months; and again takes the form of an additional duty of 2d. per gallon on motor spirit. In introducing the emergency budget of September, 1931, Mr. Snowden said: "I must confess that I regret the necessity of taxing further a commodity which is so important to modern transport, but the needs of the moment are imperative. I cannot ignore the fact that at the present time the price of petrol, apart from tax, is at a very low level, and the increase of 2d. per gallon which I put on in April has already been compensated to the consumer by an equivalent reduction in the price. I now propose to increase the duty by a further 2d. per gallon, making a total duty of 8d."

On each of the occasions when Mr. Snowden imposed an additional duty on motor spirit, his reason was the grave state of the national finances and the stern necessity of finding revenue. Since September, 1931, however, the duty on motor spirit has remained stable at 8d. per gallon, but in April, 1933, motor spirit ceased to be the sole imported oil on which a customs duty was levied. In that month another Chancellor of the Exchequer, Mr. Neville Chamberlain, took action which, in effect, imposed a duty of 1d. per gallon on all types of oil heavier than motor spirit. "All these oils," he remarked, "are now totally exempt from duty. I have received very strong representations from the coal industry, supported by the gas and electricity supply industries, and by the railway companies that in the interests of the British coal and allied industries I should review what they regard as an anomalous position."

We could ask for no plainer statement of reasons: the duty was imposed in the interests of British coal and allied industries.

The Hydrocarbon Oils Act

The British Hydrocarbon Oils Production Act of 1934 provided for a preference at the rate of 4d. per gallon for nine years on light hydrocarbon oils produced from indigenous sources. The purpose of the Act was stated concisely by Mr. Ernest Brown: "We are a coal-producing country," he said, "and few will seriously challenege the wisdom of doing everything practicable to produce at least a proportion of oil products from our greatest national asset, coal." That statement is impeccable; but you will notice that it and the Act to which it related denoted a measure of reorientation in national policy towards fuel. Hitherto imported oils had been taxed to aid the coal and allied industries, to hold the balance even between road and rail and to come to the aid of the Exchequer in a time of financial duress. From 1934 onwards, taxation of light hydrocarbon oils—that is, motor spirit—was to be maintained as a part of "doing everything practicable to produce oil products from coal."

Sir John Cadman said he could wish that Mr. Brown had specified which 4d.—Mr. Churchill's or Mr. Snowden's—was being pledged: the willing 4d. of Mr. Churchill to help coal and hold the balance between road and rail (and incidentally to finance derating), or the reluctant 4d. of Mr. Snowden, imposed grudgingly and because the stress of the times left him no alternative.

Fuel, whether it is coal or oil, is one of the raw materials of all forms of industry. So far as home industries are concerned, upward variations in the cost of fuel may not be vital so long as foreign industries are not permitted to capture the market or to depress it unduly. Nevertheless, even though not vital, high fuel costs might well be an adverse factor in the operations of the most sheltered industry. High costs cause high selling prices, which in turn bring about reduced demand, lower profits and a diminished standard of living for all consumers. With regard to foreign trade, every item in cost is of importance. If fuel in Great Britain is more expensive than it is elsewhere, that fact must inevitably be reflected in the price of our exports; and if our prices are too high, our export trade must decline. What, therefore, should be the aim of British policy? In Sir John's opinion, the aim of British policy towards fuel should be to give British manufacturers every advantage that can be obtained from ample supplies of cheap fuel.

Aiding Coal and Penalising Oil

Since the war successive Governments have been dismayed at the steady and apparently irremediable deterioration of the coal industry. At times they have tried to bolster up that industry by means of subsidies—perhaps the most pernicious form of assistance that can be given by an Government to any industry. At others, Governments have endeavoured to aid coal by penalising oil—and transferring the proceeds to the Exchequer. Instead of endeavouring to stimulate the coal industry, they adopted a policy of repressing oil. Instead of aiding British industry, they hampered it; and in so doing those Governments ignored the major problem and did no more than trifle with the minor. The Act of 1930 was the first political action which showed that the needs of the coal industry were understood by our legislature. So far as the coal industry is concerned, one primary need is for a recognition of facts.

If those facts are accepted as a true representation of the present and future situation of coal, it is evident that renewed prosperity for the industry can only spring from within. If an industry is organised for an annual output of 287 million tons and if demand falls to 221 million tons, reorganisation—including the elimination of the inefficient—is imperative.

Economics of the Synthetic Manufacture of Ammonia—II

Plant Site and Outline of Scheme

These notes were originally compiled in 1918, with the object of providing information necessary to decide whether it would be advantageous to manufacture ammonia synthetically as a commercial proposition in England. They are now published in the hope that they will prove useful to young chemical engineers, in showing the details involved in the preparation of such a scheme. The nitrogen fixation processes considered are those known as the Cyanamide, Arc and Haber processes.

HAVING pointed out that the ammonia synthesis process possesses an economical advantage over other processes of nitrogen fixation so far developed, suggestions are now given as to the most economical way of carrying out the process for the purpose of producing ammonia for fertiliser purposes. No attempt is made to prepare a detailed design or detailed estimates, but rather to consider the question from a broader point of view, so that the prospects of the process can be judged in relation to any particular proposed site. It will therefore be necessary to go through the scheme step by step in relation to local conditions before any detailed estimate can be made.

The ultimate product will be taken to be ammonium sulphate, although experiments have to be carried out and all information obtained with a view to production of ammonium bicarbonate. This substitute would be cheaper to manufacture and has every prospect of being as good, or even a better, fertiliser than ammonium sulphate. Any plant that was built would be easily changed over to the production of the bicarbonate, the CO_2 being valuable as a waste product. It would be advisable, however, to aim mainly for the sulphate in the first place, changing over to the bicarbonate as demand proved it to be as effective a fertiliser.

Site for the Plant

In the present state of the nitrogen market it does not seem advisable to erect a very large plant immediately. It would be sounder to erect a single unit of plant, enlarging it as experience is gained by the operating staff. The single unit should be erected on a thoroughly suitable site, so that (a) the capital expenditure is a minimum, and (b) extension can be made to the best advantage.

The following points must be considered with regard to the site :—

(a) Coal of suitable quality should be available at cheapest rate; the plant should be near pit's mouth.

(b) Lime, gypsum and salt (the latter not essential) should be available at cheap prices.

(c) Water suitable for boiler purposes should be available in fairly large quantities, say 1,000,000 gal. per day; a much larger quantity of water suitable for cooling and scrubber purposes should also be available, but need not be purified to the same extent.

(d) Electric power at less than 0.25d. per kWh should be obtainable on the site.

(e) Railway, canal and other means of transporting the ammonium sulphate produced, more particularly with a view to export, should be at hand.

(f) By-product plant for working up benzol, tar, ammonium sulphate, cyanides, etc., should be available near the site.

(g) Sulphuric acid works should be in the neighbourhood.

It would be easy to erect a small plant in the first place where power is already available and so produce ammonia synthetically with the least trouble, but that would be including the mean feature of the whole industry. The main problem is *the production in the most economical manner of the gases, hydrogen and nitrogen, from which ammonia has to be made.* It is with this point that these notes are chiefly concerned and it is on this point that the success of the industry rests.

Economic Factors Involved

The production of ammonia synthetically in an economical manner depends mainly on (a) the cheap production of hydrogen, (b) the conservation of heat in the catalyst chamber of the high pressure system where the ammonia is produced In fact, as coal is practically the only raw material from which the ammonia is made, the most economical utilisation of the heat and materials of the coal is the whole problem.

The principle of the synthetic ammonia process is that hydrogen (3 vols.) and nitrogen (1 vol.) are brought together under such conditions that they combine and form ammonia (NH_3). The most suitable conditions appear to be :—

(1) A pressure of about 150 atm.
(2) A temperature of about 550-600° C.
(3) A catalyst to promote the reaction (iron molybdenum)
(4) Circulation of the gases over the catalyst at a speed of about 125,000 cu. ft. per cu. ft. of catalyst per hour.
(5) Means of removal of the 2-3 per cent, by volume of ammonia formed after the gases leave the catalyst.

The hydrogen is made by the action of steam on coke. Water gas is first obtained and is then passed with steam over a catalyst, whereby the percentage of CO is reduced, while that of CO_2 is increased in proportion. The CO_2 is then removed, as well as the small percentage of CO remaining.

The nitrogen can either be made along with the hydrogen or by liquefaction of atmospheric air and subsequent separation from the oxygen. The pure hydrogen and nitrogen mixture in the correct proportions is compressed to 150 atm. Compressed gases are then circulated through a drying vessel and a heat exchanger, a catalyst container contained in a steel bomb, and finally through a scrubber for the removal of ammonia. The ammonia liquor obtained would be treated in the usual way with sulphuric acid for the production of ammonium sulphate.

The synthetic ammonia process therefore starts out with coke. The coke has therefore to be produced in the most economical manner, and of the most suitable quality for the manufacture of water gas. Coke ovens or metallurgical coke only gives about 1,000 cu. ft. water gas per 40-45 lb. of coke, but the coke from modern vertical retorts such as is used in up-to-date gas works gives as much from 30-35 lb.

There is an advantage not only in this respect in the producing of coke from coal on the site by such means, but also because of the by-products which are obtainable. In the suggested scheme, an outline of which will now be given, the synthetic ammonia process can be made self-contained. Starting with 1 to 1½ tons of coal costing less than 30s. a ton of ammonium sulphate can be obtained, which can be sold at, say, £13 to £15 per ton. There is therefore a substantial margin for working expenses, amortisation of capital, initial experimental expenses and profit.

Outline of Scheme

The coal delivered from pit's mouth will be divided into good quality coal and poor quality slack coal. The good quality coal will pass to vertical retorts, where it can be coked. The vertical retorts would be heated by producer gas from the poor quality coal. The gas from the vertical retorts and also from the producers would be treated so as to obtain the maximum of by-products from the coal. The coke obtained from the vertical retorts would pass to the water gas plant, which would be of the self-contained type, producing the steam required from waste heat boilers.

The water gas so produced would be purified by boosting through oxide boxes, and mixed with steam would pass through the water gas catalyst plant, whereby the CO is converted to CO_2 and an extra volume of hydrogen is obtained from the steam. The catalysed water gas is then further purified through oxide boxes for the removal of sulphur and the residue of 2-3 per cent. of CO is burned out by passing the gas with the necessary quantity of air through a second catalyst chamber (fractional combustion).

Before passing over the catalyst the necessary additional quantity of nitrogen for the ultimate gas is brought in by the addition of part of the flue gas from the producer gas, which is heated by vertical retorts, nitrogen being thereby obtained for such cost as is represented by the amount of CO_2 which has to be removed from such flue gas, which is

only over the small fraction which has to be removed from the hydrogen.

The gases then pass to the *compressing plant* and are compressed to 15 atm. They are then washed with water under pressure, whereby the CO_2 is dissolved out. The final traces of CO_2 are removed by scrubbing with ammonia under pressure, and the hydrogen and nitrogen then pass on to the *ammonia synthesis plant.*

The gas from the vertical retorts is burned under boilers and raises the steam for driving the compressors. Non-condensing engines are employed and the low pressure steam obtained is used in the water gas catalyses and for the fractional combustion. More than half the total power required on the plant is thus supplied by the gas from the original coal required to produce the coke.

The remainder of the power which is subsequently necessary for the heating of the bombs in the ammonia synthesis plant can be obtained from outside sources or raised from coal on the site. It might, of course, be more advantageous to burn coal under the boilers for the raising of the steam and sell the gas obtained by coking the coal for town supply purposes, but this depends on local conditions.

The compressed gases are then further compressed to 150 atm., and, after passing over nickel at 300° for the final removal of traces of CO, enter the circulation system at such a flow as is required to make up for the removal of ammonia from the system.

A rapid flow of gas is maintained by the circulation pump through a unit consisting of about five bombs with a drying vessel and a heat exchanger in circuit with each bomb. The bomb consists of a steel vessel containing a heat interchanger surrounding the catalyst contained. The walls of the bomb are protected thus from the action of the gases at the high temperature existing in the centre, *viz.,* 600°. The walls are further protected by internal lagging.

The gases before passing over the catalyst and after leaving the interchanger are brought to the required temperature by electric heating.

An external exchanger completes the interchange of heat, with a total efficiency of, say, 90 per cent. (but such efficiency will fluctuate to some extent and will depend on the activity of the catalyst).

The gas, after passing out of the bomb system, is then brought back and passed through a counter current scrubber into which water is pumped and which dissolves out the ammonia.

After releasing the pressure in a breakdown vessel the ammonia liquor passes to a plant where it is treated with sulphuric acid or with CO_2 for subsequent treatment with gypsum, or for the production of the bicarbonate.

Raw Materials and Products

The only *raw materials required* in this process are thus: coal, air and water, sulphuric acid or gypsum.

The *products obtained* are ammonium sulphate, CO_2, benzol, tar, cyanogen, ammonia, etc.

The whole of this scheme rests on a fairly sure basis. The system of production of coke and coal, gas and by-products therefrom, has been fully worked out. The catalysis of the water gas, as it is understood, has been carried out in Germany for several years, and the experiments made on 120-200 cu. ft. per scale have been confirmed by working with an experimental plant.

The fractional combustion of the CO has so far proved satisfactory, even in the presence of fairly large quantities of CO_2. Th removal of CO_2 by washing under pressure with water has been operated in this country for some years past, and sufficient details are known. There are various alternatives to such a scheme of removal of the CO_2 and these are discussed.

On the above basis the plant would consist of coal store, vertical retorts, by-product plant, gas plant (producers and water gas generators), purifier shed, converter house, compressor plant (engine house), scrubbing plant, ammonia synthesis plant, ammonium sulphate plant, store and packing house. Besides these there would be offices, laboratory, stores, workshops, boiler house (generator house), and catalyst house, etc.

The plant to be considered can be destined to produce, say, 30,000 tons of ammonium sulphate (25 parts ammonia) per annum. The daily production will be taken as 100 tons perday of 24 hours; coal to be handled for coke production 100 tons; poor quality slack coal for the producers 18 tons; extra power required about 1,400 kWh = 30 tons coal.

The plant will be divided into four units. It is recommended that one unit only should be erected in the first place. The existing by-product, acid works, electric power, offices, etc., would suffice for dealing with such a unit and these could be enlarged as required when the erection of the whole plant was proceeded with. It is important to guard against unnecessary capital expenditure. The working costs of the plant ought to be very small, but the amount of plant required is certainly large, and in order to obtain the full advantage of the process a capital expenditure must be kept as low as possible.

Quantities (Molecular Basis)

Calculated data has been prepared to show the number of mols. of the various products during the process required for the production of one mol. of ammonium sulphate. Theoretically, 3 mols. of carbon (in coke) should give 1 mol. of ammonium sulphate. The scheme opposite assumes certain yields indicated against the arrows, so that instead of the 3 mols. of carbon 6.2 are required. The overall yield assumed, therefore, is only

$$\frac{3}{6.2} = 48.5 \text{ per cent.}$$

The power required to raise the steam is allowed for in the above estimate. It will be seen that the gas from the coal coking process is sufficient to provide the necessary heat to raise the steam.

Taking 8 lb. steam = 1 lb. coal, then $\frac{8 \times 18}{12} = 12$ mols. steam = 0.85 mols. of carbon (in coal) 85 per cent. Therefore 1 mol. of carbon (in coal) = 14 *mols. steam.*

Steam required for catalyst is about 4 vols. to 1 vol. of hydrogen, *i.e.,* $4 \times 4.95 = 20$ mols. $H_2O = \frac{20}{14} = 1.43$ mols. of carbon, leaving $10.3 - 6.2 - 1.4 = 2.7$ *mols. of carbon still available.*

Steam for water gas is obtained from the heat of the blow. 36 lb. steam = 2 mols. $H_2O = \frac{1{,}000 \text{ cu. ft.}}{385} = 2.6$ mols. of water gas. Therefore 1 mol. of water gas requires 0.77 *mols.* of steam (theory 0.5). Therefore 5.7 mols require $\frac{0.77 \times 5.7}{14\ (?)} = 0.313$ *mols. of carbon* (in coke).

There is available $6.2 - 5.7 = 0.5$ mols. of carbon (assuming the "blow" burns as much carbon as the "make"). Therefore there is still the equivalent of 0.2 mols. of carbon in the available heat after raising the steam.

1 mol. of ammonium sulphate = 132 lb. = $10.3 \times 12 \times \frac{100}{85} = 145$ lb. coal, *i.e.,* 100 tons ammonium sulphate = 110 tons of coal.

Weights and Volumes (Daily Basis)

Ammonium sulphate: 100 tons per day of 24 hours $= \frac{100}{132} = 0.757$ ton mols.

Ammonia: $2.11 \times 0.757 \times 17 = 26.4$ *tons.*

Sulphuric acid: $1.06 \times 0.757 \times 78 = 78.5$ tons.

Hydrogen (pure): $3.96 \times 0.757 \times 2 = 6$ tons $= 6 \times 430{,}000$ cu. ft. = 2,580,000 c.f. @ 20° C.

Nitrogen (pure): $1.32 \times 0.757 \times 28 = 27.9$ tons $= \frac{2{,}580{,}000}{3} = 860{,}000$ c.f. @ 20° C.

Catalysed gas: Hydrogen $= \frac{21{,}580{,}000 \times 80}{100} = 3{,}220{,}000$

$CO_2 = \frac{3{,}220{,}000}{2} = 1{,}610{,}000$ or about 4,830,000 c.f. @ 20° C. (without N_2, etc.).

Water gas: $1.15 \times 3{,}220{,}000 = 3{,}700{,}000$ c.f. @ 20° C.

Coke @ 40 lb. per 1,000 c.f. W.G. $= \frac{40 \times 3{,}700}{2{,}240} = 66$ tons.

Coal @ 12 tons coke per 20 tons coal = 110 tons per day.

The yields are taken so liberally throughout that there is every reason to hope for considerably better efficiency.

Developments in the Real Silk Industry

By A. J. HALL, B.Sc., F.I.C., F.T.I.

THE large amount of publicity now given to rayon products serves to cast something of a shadow on the real silk industry and to suggest that it is passing through a period of stagnation, but the truth is quite otherwise. For many purposes, pure silk cannot be replaced by its rival, rayon, and indeed along some lines pure silk is ousting rayon. A notable instance of the greater popularity of pure silk is to be found in the hose industry. A year ago the price of pure silk reached a very low level and there was a distinct possibility of silk materials competing successfully, not only in quality but also in price, with rayon goods. This was particularly the case with goods made with the lowest denier yarns, since rayon becomes much dearer in the form of fine yarns whilst the price of fine pure silk yarns is not much different from that of coarser yarns. But since then, pure silk prices have advanced and now it is considerably more difficult for this fibre to compete with rayon on a price basis.

The Degumming Process

Turning to the actual processing of pure silk goods it may be observed that quite a large amount of research has recently been directed towards an elucidation of the physical and chemical changes which occur when silk is degummed. It will be remembered that degumming is one of the most important processes to which almost all silk goods must be subjected. Raw silk threads, as taken from the silkworm's cocoon, are really double threads of fibroin cemented together with silk-gum or sericin. The raw silk threads are strong, but are relatively harsh in handle and are generally lustreless and coloured from deep to pale yellow. Degumming removes the sericin so that the double threads are resolved into single threads which are soft, almost white in colour, and lustrous; at the same time the silk threads lose somewhat in strength.

Degumming is carried out with an alkaline solution, and experience during many years has shown that the presence of a soap or soluble oil is beneficial. It is desirable for degumming to be economical as regards labour and chemicals, but at the same time the silk must be deteriorated as little as possible. Until recently no clear difference between the action of an alkaline substance, for example, sodium carbonate or caustic soda, and a soap in degumming could be recognised; only the results were definitely known. Degumming with dilute caustic soda makes the silk harsh and leaves it with a residual yellowish tint, whilst degumming with soap makes the silk soft and white. It is now known that during degumming both the fibroin and the sericin chemically combine with the alkali present to form insoluble and soluble compounds respectively. If no soap is present then the alkali is simply removed from the fibroin during subsequent washing so that the swollen cuticle of each fibre collapses and ultimately dries compactly leaving the silk harsh. But if soap is present in the degumming bath, then, owing to withdrawal of alkali by chemical combination with the silk, there is liberated a certain amount of free fatty acid in the degumming liquor. This remains uniformly dispersed by the unchanged soap, but it is present in the silk fibre cuticle during washing and prevents the rapid collapse and hardening which occurs when fatty acid is absent.

Rate of Removal of Sericin

The rate of removal of sericin from raw silk with aqueous solutions of alkalis is intimately dependent on the nature of the alkali rather than the *p*H of the degumming liquor or the concentration of alkali. In marked contrast is the discovery that with soap degumming liquors the rate of degumming varies directly with the soap concentration. In practice it is common to use for degumming a mixture of soap and an alkali and under these conditions the effects of both types of degumming agent are additive. Mild alkalis, also, are extensively used in degumming silk in conjunction with sulphonated oils. In this case the sulphonated oil has practically no degumming action but it assists the production of silk having good handle and colour. No evidence has been discovered to show that the sulphonated oil retards degumming.

The degumming efficiencies of a number of mild alkalis have been determined by O. A. Hougen ("Textile Research," 1935, *5*, 191) with the following results:—

Degumming Agent	*Order of Efficiency*	*Coefficient Efficiency*
Caustic soda	1	3.6
Sodium carbonate	2	2.27
Sodium silicate (SiO_2/Na_2O = 1.63)	3	1.025
ditto (ditto = 2.62)	4	0.975
ditto (ditto = 1.00)	5	0.595
Trisodium phosphate	6	0.400
Sodium bicarbonate	7	0.298
Sodium silicate (SiO_2/Na_2O = 3.73)	8	0.175
Borax	9	0.147

The above results are calculated on the basis of weight of agent on the weight of dry silk.

Improved Degumming Media

Although in many silk dyehouses soap alone is used for degumming, it has become more common in recent years to use a mixture of sodium silicate and a soluble oil. For many purposes it is essential that the sericin be completely removed. It is surprising how comparatively a small amount of residual gum can cause the silk to have a harsh handle. This is particularly noticeable with pure silk hose. A simple staining test by which residual gum can be detected is thus required. It has been supplied by Denham and Dickinson ("J. Soc. Dyers Col.," 1935, *51*, 93), but other workers, such as Wagner and Herzog, have suggested equally useful tests. In the cyanine staining method of Herzog ("Textilber," 1932, *13*, 121 and 181) the staining reagent is prepared by making a cold saturated solution of the dye in water, diluting with an equal volume of water, and then adding one-third volume of glycerine. The degummed silk is then immersed in this solution. Since fibroin remains substantially unstained whilst sericin acquires a blue colour, it is thus easy to ascertain whether or not the silk has been completely degummed.

It is likely that a further study of sericin could yield very interesting results in view of those already obtained. Evidence points to the conclusion that sericin is not a simple substance but that it is deposited by the silkworm in three layers, and that these differ in composition. The outer layer is known as sericin A, the middle layer as sericin B, and the inner layer (the evidence for the existence of this is less satisfactory) as sericin C. These different sericins can be separated by fractional precipitation from a degumming liquor by adjusting its *p*H to suitable values. Sericin B is the most valuable constituent of the silk gum in so far as it has excellent dispersive and penetrating properties which become effective when the degumming liquor is used as an assistant in dyeing silk.

Deterioration Tests

The deterioration of silk goods by wear and exposure to light is of considerable importance. Hitherto it has been possible to follow such deterioration by strength tests and also by estimating the increased ammonia-nitrogen and amino-nitrogen contents of the silk. The ammonia-nitrogen is determined by boiling the deteriorated silk in a saturated solution of magnesium oxide, and the amino-nitrogen by treating the silk with nitrous acid using the method of Van Slyke. Recently, however, it has been shown by Trotman and Bell ("J. Soc. Chem. Ind.," 1935, *54*, 141 T) that a viscosity test can be applied and that deterioration in silk results in an increased fluidity of its solution in zinc chloride solution of sp. gr. 1.67. Treatment of silk with dilute alkalis and acids, oxidising agents (hydrogen peroxide as used for bleaching silk), and solutions of salts, such as sodium sulphate and chloride, lower the viscosity of the silk. As might be expected, degumming leads to a small decrease in viscosity. The new method of Trotman and Bell is somewhat analogous to the well-known method of estimating damage in cotton by measurement of its viscosity in cuprammonium solution, and it is to be hoped that it will prove equally valuable.

The loss of strength in silk goods exposed to sunlight has been shown to be intimately dependent on the *p*H of the silk. Silk has its maximum stability to light when at *p*H = 10. It appears to suffer most deterioration when exposed to light under acid conditions. From results obtained by Dr. D. A.

Eichler ("Textilber," 1935, *16*, 429) pure silk seems to be less stable to light than rayon fibre:—

Percentage Loss after Exposure to Sunlight for 250 hours.

Fibre	*Tensile strength*	*Extensibility*
Real silk	62	63
Rhodiaseta (acetate) rayon. ...	24	35
Cuprammonium rayon ...	57	68
Viscose rayon	35	50
Bleached cotton	0	8

Since a large proportion of pure silk is used in the manufacture of hose it is not surprising to find that recently considerably more attention has been paid to hose finishing machinery than hitherto. The appearance and handle of silk hose can be largely influenced by finishing methods, and, although all this finish is removed by the first wash, it plays an important part in selling the hose. At one time all hose was finished by drawing each stocking on a wooden shape and then pressing this between steam-heated plates. This method is now seen to have certain disadvantages, especially in that the silk threads of the stocking cannot move or adjust themselves during the pressing and that they are liable to become glazed whilst in contact with the hot metal plate. For this reason alternative methods have become much more popular during the past year. New finishing machines are now available in which the stockings are placed on thin flat aluminium shapes, and these are then led continuously through a series of chambers or rollers where the stockings are wetted or moistened with steam and then dried by exposure to hot air. It is evident that at no stage during drying of the hose is the silk subject to pressure and under these circumstances a different finish is obtained. As yet the new finishing machines do not make the finishing of hose cheaper; they merely give a different and apparently better finish.

Budgetary Control as an Aid to Management

By L. A. WIGHT, A.C.W.A.

ONE of the most recent and important developments in the field of industrial management is undoubtedly "budgetary control." The ever-increasing application of scientific methods of production has made it essential for managerial policy to be directed much more ahead of time than hitherto. In view of this, budgeting or forecasting must necessarily play an important part in guiding the management in formulating their forward policy, and, at the same time, indicating what the result of that policy will be.

Stated briefly, budgetary control, applied to a manufacturing organisation, provides a definite objective in relation to all its activities, against which measurement of actual attainment is possible. A factor which largely contributes to the success of budgetary control in a business is that all departments or functions therein should be in complete coordination, that is to say, no department or section of the business should be considered watertight. The two main constituents of the budget are sales and cost of production. In the scope of this article it will be possible to outline only some of the major principles involved. No hard and fast rule can be laid down as to the application of these principles. Many businesses find it a simple matter to apply budgetary control in all its aspects, whereas in other concerns the system undoubtedly has its limitations. In any event, even a restricted measure of budgetary control is better than none at all, and it is surprising, when once introduced, how simple it can be extended with advantage.

At the Sixth International Congress for Scientific Management which was held in London in July last, and which was attended by delegates representing over thirty countries, it was evident that budgetary control is now widely practiced in one form or another, with a view to assisting and guiding managerial policy. It is appreciated that, in certain businesses, the preparation of a budget of sales, even for a short time ahead, is fraught with many difficulties. On the other hand, it should be borne in mind that, even in the absence of a scheme of budgetary control, there must necessarily exist some indication of the probable future sales demand, otherwise it would be impossible to carry on production economically. The acknowledgement of this fact provides the starting point from which will emerge the fundamental principles of budgetary control.

The period of time which the budget or sales forecast is intended to cover will naturally be entirely dependent on individual circumstances, some of which may be briefly stated, *viz.*, seasonal tendencies, market conditions, both for home and export, etc. It is much better to fix sales forecasts every three months with a reasonable degree of accuracy, than to cover a longer period with possible error or mis-judgment.

Before any real progress can be made in regard to budgetary control, there should exist what is known as a basic or standard budget. The following will serve as an example:

BASIC OR STANDARD BUDGET.

Sales	£80,000	100%
Cost	£60,000	75%
Profit	£20,000	25%

If we accept the foregoing as a basis on which to work upon, what remains to be done is to project the results under expected changed conditions. For example, the sales are governed by two factors or variable, *viz.*—*volume* and *price*. For the period under review it may be thought desirable to budget for an increased volume, in order to counterbalance an expected fall in price. If, therefore, we take the basic or standard "volume" and "price" to be 100 in each case, the calculation involved can be expressed by the use of ratios as follows:

Expected:—
Price Level .. 90
Volume ... 115
Therefore 90 × 115 = 103.5
103.5% of the basic sales £80,000 = £82,800.

It will be noted, therefore, that the expected sales are 3.5 per cent. above the basic budget. This, however, has been brought about by taking *prices* at 90, or 10 per cent. *below*, and *volume* at 115, or 15 per cent. *above*, the datum line or standard.

Taking the calculations a stage further, the next step is to determine the expected profit on the above sales. If we assume that the increase in volume of 15 per cent. would result in a decrease in cost of 3 per cent., the position can be reviewed as under:

Price ...	90
Volume ...	115
Cost ...	97
Basic ratio of Cost to Sales ...	75

		Ratio to Basic Budget	Basic Budget
Expected Results:—			
Sales (90 × 115)	=	103.5	100
Cost (75 × 97 × 115)	=	83.7	75
Profit	=	19.8	25

Summary:—

	Basic Budget	Expected Results
Sales ...	£80,000	£82,000
Cost ...	£60,000	£66,960
Profit ...	£20,000	£15,840

Ratios:—

Price ...	100	90
Volume ...	100	115
Net Sales ...	100	103.5
Cost ...	100	97

It will be quite clear from the foregoing that the increase in volume of 15 per cent., coupled with a decrease in cost of 3 per cent., is not sufficient to counter-balance the drop of 10 per cent. in price, as the profit under expected conditions is only £15,840, compared with the basic budget profit of £20,000. In view of this, it may be considered desirable to determine at what price level sales must be maintained for a volume of 115 and with costs at 97, in order to yield a profit of £20,000 as per the basic budget. The answer is very simply derived:

Volume	...	115
Cost	...	97
Basic ratio of Cost to Sales	...	75
Therefore, Expected Cost (75 × 97 × 115	=	83.7
Add. desired profit margin		25.0
Net Sales	... ...	108.7
Divided by Volume, 115 = Price Level	...	94.5
Check :—		
Sales	... ...	£86,960
Cost	... ...	£66,960
Profit	... ...	£20,000

It will be observed from the above that, if the desired margin of profit is to remain the same as the basic budget at £20,000, the price level must be maintained at 94.5, or roughly 5 per cent. below standard. If, on the other hand, it is felt that this price level is too high, the only alternative is to further increase volume or reduce costs.

The use of ratios as adopted in the foregoing illustrations should be quite clear. In the first place, they indicate the relationship between the several variable factors in comparison with the basic budget. They also considerably facilitate the calculation of results under various expected conditions; in fact, the three factors, price, volume and cost, can be calculated in any desired combination. As already mentioned, it is essential to have a basic or standard budget, in order that the subsequent budgets may be definitely comparable. For example, subsequent actual results can be brought into comparison with the basic budget as follows:

	Basic Budget.	1930	1931	1932
Price ...	100	90	95	100
Volume ..	100	115	110	120
Cost ...	100	97	100	110

At a glance it will, therefore, be seen that the price level has definitely improved, likewise volume, but, on the other hand, cost of production has increased. In the absence of a basic budget, each year's actual results can only be compared with the previous year, and as the basis of comparison in such circumstances is always changing, it will be difficult to observe the actual trend of affairs.

When the budget has been definitely determined and agreed upon, the real work of control commences. The sales quota requires to be broken down, or analysed, by lines of products, markets, and individual areas. The question of seasonal tendancies is a matter of the utmost imporance, as it is essential that the production budget should be sufficient to meet the expected requirements for the period under review. It is perhaps in this respect that one of the most important advantages of budgeting is apparent, inasmuch as it is possible to formulate a constructive production programme on definite lines. A considerable amount of detail in respect of the production programme will be required, in order to support the budget. The output capacities of the various processes will be known and this will permit of the flow of work being balanced between departments. Thereafter, costs require to be dealt with under the four main elements of labour, material, factory overheads, and selling overheads. The proportion of these four elements to the total cost will be in accordance with the basic budget, subject if necessary, to any adjustments which may have been made in computing the expected results. Subsequent actual costs must be compared in detail with the budget at short intervals, otherwise the desired control will be lacking.

It will be appreciated that no budget is infallible, and that in consequence it may be found necessary from time to time to revise the sales and production programme when circumstances warrant it. Budgetary control is not a substitute for effective management, but should be used rather as an instrument of control. The outstanding advantages to be derived from an intelligently prepared budget is that executives are conversant with what is happening over a short period, without waiting until the final accounts are prepared. In such circumstances, any investigation is purely retrospective in character.

Research Chemist Killed on Seashore

Alleged Attack by Mental Patient

An inquest was held at Bryn-Neuadd Hall, Llanfairfechan, on Monday, on Dr. Ronald Sidney Morgan, 31, of Woodburn, Rock Ferry, Cheshire, a chemist on the research staff of Lever Brothers, Ltd., at Port Sunlight, who was found dead on the shore at Llanfairfechan on Sunday with injuries to his head. The jury found that Dr. Morgan had been killed by Dr. Frederick Carl Victor Koch, a certified patient at Bryn-Neuadd Hall, which is a branch of St. Andrew's Hospital, Northampton, whom Dr. Morgan had visited on Sunday and taken out for a walk. The coroner committed Koch for trial on the charge of murder.

The Coroner for North Caernarvonshire (Mr. Pinter Williams) said that Dr. Morgan was a very brilliant man. He used to come to Llanfairfechan very frequently to see Dr. Koch, who had been there for some time. Dr. Morgan went there on Sunday and some time in the afternoon he took Koch out for a walk. Koch was not allowed to go out alone, but he was permitted to go with his friend, who vouched for his safety. For some unknown reason Dr. Morgan was violently attacked. Koch got him on the ground and his head was battered most fearfully with a stone. Koch returned to the hall covered with blood, and said that something serious had happened. Someone meantime had telephoned for the police. They went to the spot and found Dr. Morgan dead. There was no doubt that he met his death as the result of the injuries he received.

The Coroner asked if Dr. Koch could be present at the inquest, but was told that he was not in a fit state to be present.

Dr. Ruby Stern, acting medical officer at the Hall, said that Dr. Morgan asked her permission by telephone to take Koch out. Koch would not have been allowed out unaccompanied.

The Coroner: Was he of a violent disposition?—Not since he has been here and, so far as I know, not for some months previously.

You never anticipated any violence on his part?—No.

Dr. Stern said that later in the day she received a message that Koch had killed Dr. Morgan. When she saw Koch he had collapsed. She took a statement from him. She asked him what had happened to Dr. Morgan, and Koch said: "Twelve years ago he insulted me, so I took him out and just killed him. I killed him with a stone and finished up with a stone." Koch was silent for a minute or two after that, and she said to him: "Are you not sorry you killed Dr. Morgan?" He replied: "I can't help it now. I am not sure." Dr. Stern said that a little later she was told that Koch had made another statement about "finding the body half-way between here and Aber."

Stanley Eric Clayson, an attendant at the Hall, said that he last saw Dr. Morgan alive at 3 p.m. on Sunday. Permission was given to Koch to go with Dr. Morgan. When Koch returned to the home his face and clothes were covered with blood. Clayson added that he dressed three wounds on his face and got him to bed. Lated Koch said: "The body will be found between here and Aber." Koch had been out on previous occasions with Dr. Morgan and they were on friendly terms.

Owen Lewis, an elderly man, who gave evidence in Welsh, told how he had seen Dr. Morgan being attacked. He said that he heard shouting coming from the direction of the shore. He thought that someone might be in trouble in the sea, as the tide was then coming in, and he went towards the shore. He could see a man with a big stone, which he held in both hands, said the witness, and he moved his arms up and down to show how the man on the ground was being struck.

Two bloodstained stones, one of them sharp-edged and about a foot long, were produced, and identified by the witness. A police officer stated that the larger of the stones weighed 28½ lb. and the other 8 lb.

Dr. Helsby, police surgeon, of Bangor, said that when he went to the shore he found Morgan with his head wedged between large boulders. The right side of his face was flat-

tened, and a boulder had been lying on it. The injuries which Dr. Morgan received were the cause of death, and were consistent with his having been battered with a large boulder. He had received a comminuted fracture of the skull. Later, the witness said, he saw Koch, and advised the Chief Constable that the man was in an utterly unfit condition to be moved, adding that he was well looked after where he was. He was isolated and was watched night and day.

The Coroner, replying to a juryman, said that neither Dr. Morgan nor Koch was a medical man. They were both doctors of science.

Mr. E. Williams, Chief Constable, said that he saw Koch in his room on Sunday night. His head was bandaged, and he appeared to be weak, dazed, and indifferent. Once he smiled and remarked to Dr. Stern: "I think I feel better." He was told by Dr. Stern that Koch was a certified patient, and it would be unsafe to arrest him. He decided not to arrest him.

The Coroner, addressing the jury, said that there was no doubt that Dr. Morgan's death was due to the injuries he received, and there seemed little doubt as to who had caused the injuries. Koch was a certified patient, and the law was that no one could commit murder unless he was of full and sound knowledge and understanding. The only time a coroner's jury could consider the state of a man's mind was when he had killed himself. They were not supposed to enter into the state of his mind at other times. That was a matter for another court. It seemed to him to be the jury's duty to commit Koch to the Assizes, and the judge would know how to deal with him. Referring to the responsibility of the authorities, the Coroner said that it was difficult to see what else the management of the home could do. They could never say what a man like that would do, but it was impossible to keep him always under restraint, and he would appear to be in the best custody possible in the charge of an old friend. Dr. Morgan had behaved in a very humane way in coming so often to see an old friend, and everything quite proper had been done so far as that institution was concerned.

The jury, after an absence of about half an hour, returned a verdict that Dr. Morgan had been killed by Koch by means of blows on the head. They added a rider that, in their opinion, no blame attached to the officers of St. Andrew's Hospital, Northampton, but they respectfully asked them to consider their regulations relating to patients leaving the hospital premises without an attendant.

Dr. Morgan had been married five years and had two young children. He and his wife lived in the South of England before he went to Port Sunlight.

Methyl Bromide as Fire Extinguisher

Another Demonstration at Richmond

NEARLY two hundred visitors, comprising chemical manufacturers and users, fire brigade officers, Government officials and representatives of various commercial undertakings exposed to exceptional fire risks, witnessed a demonstration of fire fighting with methyl bromide apparatus at the works of the National Fire Protection Co., Ltd., at Petersham Road, Richmond, on October 3. The demonstration was on similar lines to that described in THE CHEMICAL AGE of April 6 last (pp. 311-312), and some remarkable results were recorded. Two entirely new types of extinguishers were employed, and a toxicity test was included in the programme.

Four fires consisting of 3 pints petrol and 2 lb. of wood wool in a tray 40 in. by 26 in. were allowed to burn for 20 seconds and then attacked as follows: (a) Quart pump type carbon tetrachloride extinguisher, out in 40 secs.; (b) two-gallon foam extinguisher, out in 58 secs.; (c) No. 3 standard "Essex" methyl bromide extinguisher (1 quart), out in 7 secs.; (d) No. 1 ditto (½ pint), out in 5½ secs. The conditions of this test were repeated substituting ether for petrol. Ten seconds after ignition the fire was extinguished by a No. 3 "Essex" in 22 seconds. The conditions were again repeated substituting methylated spirits for petrol. Ten seconds after ignition the fire was extinguished by a No. 3 "Essex" in 5 seconds.

Rapid Extinguishing Action

Two gallons of petrol were allowed to run from a container down a 12 ft. length of guttering into a bath 40 in. by 18 in. and attacked after ignition. A quart pump type C.T.C. extinguisher failed to have any effect beyond producing large clouds of black smoke. The fire having obtained a strong hold was finally extinguished with two No. 5 "Essex" extinguishers. With a two-gallon foam extinguisher the fire was extinguished after 90 secs., but the flow had been cut off, as success appeared to be otherwise unlikely. With a No. 4 SLV "Essex" methyl bromide extinguisher (½ gal.) the fire was extinguished in 10 seconds, and after being relit, was extinguished again with the same extinguisher in a further 14 seconds.

A gallon of ether was allowed to run from a container down a 12 ft. length of guttering into a bucket and attacked after ignition. Two quart pump type C.T.C. extinguishers were used, though one did not give a good jet. After 80 seconds the bucket and the guttering were extinguished, but the main container was still alight. Using a two-gallon foam extinguisher after 65 seconds the fire was nearly extinguished, but had to be finished off with a No. 3 "Essex." With a No. 3 SLV "Essex" methyl bromide extinguisher (1 quart) the fire was extinguished in 7 seconds.

Two trays each 18 in. by 24 in. containing half a gallon of fuel oil and toluol were ignited simultaneously and attacked after 10 seconds by a No. 3 SLV "Essex" methyl bromide extinguisher which extinguished both fires in 5 seconds.

Three fires consisting of 10 gallons of methylated spirits in baths 40 in. by 18 in. were attacked after ignition. In the case of a two-gallon pressure type C.T.C. extinguisher after 100 seconds when the extinguisher was apparently empty the fire was still burning just as fiercely and it was then extinguished by a 3-seconds application of a No. 5 "Essex." Four two-gallon form extinguishers were then used, the last two being used simultaneously, but after 5½ minutes the fire was still burning. With a No. 5 SDV "Essex" methyl bromide extinguisher (1 gallon) the fire was extinguished in 8 seconds.

Two old motor car inner tubes were ignited by petrol, and when the rubber was properly burning, it was attacked by (a) No. 5 SDV "Essex" methyl bromide extinguisher (1 gallon), out in 5 secs.; (b) two-gallon foam extinguisher, out in 75 secs.

One gallon of cellulose solution was placed in a tray and smeared on the walls of a dummy spraying cabinet which was fitted with a No. 5 (1gallon) "Essex" electrical automatic appliance, involving a flame-sensitive fusible electric contact switch together with a pipe line. A match was thrown in and four seconds later a slight report was heard, indicating that the extinguisher had commenced to operate. At the same time a bell commenced to ring. Eight seconds later the fire was extinguished without any human assistance, while the discharge of methyl bromide continued for 11 seconds.

Featherspray Extinguishing Sets

One gallon of petrol was poured into the bilges of an 18 ft. launch, which was fitted with a No. 4 (½ gallon) "Essex Featherspray" set, involving a pipe line discharging in five points. After the petrol had been burning for 11 seconds, the operating lever on the extinguisher bracket was forced upwards and the fire was extinguished in a further 3 seconds. The methyl bromide continued to discharge for 14 seconds more.

In a room measuring 10 ft. by 12 ft. and 10 ft. high, a small quantity of petrol and wood wool was ignited and extinguished by a No. 3 "Essex" methyl bromide extinguisher. There were present in the room about 15 visitors. Owing to the large number of persons who wished to be present, the extinction was repeated with a further dozen visitors. In both cases the visitors remained in the room for some minutes after the use of the extinguisher, and feeling no ill effects, thoroughly enjoyed their tea subsequently.

Fertilisers for the Sugar-Beet Crop

A Series of Experiments in Progress

EXPERIMENTS are being carried out at various centres to ascertain the effect of different manures and types of land on the sugar-beet crop. In the Kidderminster district the trial plots of land are at Shenstone, and they were inspected on Tuesday by the sugar-beet growers of the area. There are twenty-seven plots. The experiments are being conducted by the Rothamsted Experimental Station in co-operation with the agricultural organiser for Worcestershire and the sugar factory agriculturist. Following the inspection of the trial plots some three hundred growers assembled at the factory of the West Midland Sugar Co., Ltd., when figures relating to the growth of sugar-beet cultivation in the district were given by Mr. C. Brinton. He said that in ten years the area grown for the factory had increased from 2,723 acres to 19,086 last year. The weight of beet had increased from 29,000 tons to 191,000 tons.

Consistent Result of Experiments

Mr. H. V. Garner, of Rothamsted, gave an address on "Manuring of sugar-beet on light and medium loams." He emphasised that if a good plant can be secured and a reasonably favourable season is encountered, a fair yield of beet can be secured on many soils without manures. To achieve this, Mr. Garner said, they must have a soil that was not acid and a high standard of cultivation. This procedure was not to be recommended because they had only laid the foundation of a crop that, by the expenditure of a few shillings on fertiliserss, could be definitely and economically improved. With regard to the effect of nitrogen, he said they had the element that had given the most consistent results in British sugar-beet experiments. The action of nitrogen was readily observed in the growth and vigour of the tops, and this increase was usually reflected in a marked increase in roots, except on soils already in a very high state of fertility. The fact was that the tops could exploit nitrogen long after the roots had attained their maximum crop. Another effect of nitrogenous manures was that they tended to reduce the sugar content of the roots. It was easy to over-emphasise this point. Actually the increase in weight of roots easily counterbalanced the reduction in sugar percentage and resulted in a gain of sugar per acre. The exception was when soils were in extraordinarily high condition, such as fenland soils that were capable of producing heavy crops without manure. All forms of nitrogen had done well on sugar-beet; probably nitrate of soda was slightly more effective than the others when used on an equal nitrogen basis, but for ordinary purposes sulphate of ammonia was cheap and convenient, as it readily mixed with the other manures.

A Gain of Sugar per Acre

Referring to potash, Mr. Garner said there was a wide choice of salts providing this essential plant food. The need of potash made itself felt, particularly on sandy soil where no farmyard manure was used. It affected the crop in two directions; giving a moderate increase in weight of roots and a definite but small increase in sugar percentage. The result was a gain of sugar per acre. Recent experiments in which agricultural salt had been tried had generally shown good results, although there had been exceptions. There was usually an all-round improvement in the crop, in roots, tops, and in sugar content. The time of application of the salt was under examination, but it was usually applied like kainit a few weeks before sowing. Those who favoured nitrate of soda top-dressings could mix 2 cwt. or 3 cwt. of salt with the nitrate with good effect.

Although superphosphate was almost always used in sugar-beet mixtures, there was not in recent experiments a great deal of conclusive evidence that it was required in large amounts. It had, on the whole, done better on the heavy, moist and peaty soils than on the dry light land. Its well-known property of hastening maturity was of no great value in dry years on sandy soils, but came in more usefully when excess of moisture and nitrogen tended to keep the plant in full growth late in the season. About 4 cwt. per acre of superphosphate in the mixture should suffice for ordinary light land conditions. Experiments were on foot to decide whether variations in the method of applying the artificials had any effect on their action. Nitrogen presented no difficulty; it did well applied before sowing if sulphate of ammonia was used, and only in wet districts was it necessary to hold some nitrogen back for top-dressing. There was nothing to be gained from late top-dressing. The minerals, phosphate and potash, might possibly gain from early application or even from being ploughed under. These points were being examined. In the meantime, it was hoped by the series of experiments to put the important questions of the relation of soil type to manurial requirements on a more scientific foundation, so that ultimately it might be possible to predict with some certainty the most effective manuring in particular cases.

Mr. W. Morley Davies, of Harper Adams College, in an address on "Liming in the West Midlands," said the main object of liming arable land was to remove acidity. In grass land there was another object, which was to increase the lime content of the grass. This was of great importance in relation to stock feeding. It was advisable to know exactly how much lime was required to bring the land to the right point rather than make guesses. and the information could be obtained by having the soil analysed by agricultural chemists. With regard to waste at sugar factories, lime was one of the by-products at these factories, and agriculturists who lived in the area of a sugar factory had the opportunity of carting the waste at economical prices.

New Coal Distillation Plant

2,000 Gallons of Diesel Oil per Day

To mark the completion at Tipton of the building of the first of a number of coal distillation plants that the National Coke and Oil Co., Ltd., intends to erect at suitable sites throughout the country, the directors of the company entertained to dinner at Tipton on Monday the contractors and 150 of the workmen who have built the plant, and the men who are to work upon it in future.

Mr. W. B. Mitford, who is at the head of the enterprise, presided and was supported by Dr. L. Capper Johnson, Mr. Corbett W. Woodall and other directors; Mr. E. W. Brocklebank and Mr. W. H. Jones, general managers; Mr. J. L. Strevens and Mr. J. D. A. Lewis, of the technical staff, and representatives of the main contractors, Horseley Bridge and Thos. Piggott (Ltd.), Horseley Works, Tipton.

Mr. Mitford said that the plant would make available each day 120 tons of smokeless fuel, 2,240 gallons of motor spirit, and 2,000 gallons of Diesel oil. Its consumption of the raw material—coal—would give permanent work to 150 coal miners every day in the year, and every similar plant would give continuous work to a similar number of miners. Some of the workmen had already left the Tipton plant to hasten the completion of the second plant at Erith. Such a plant had never been built before. To industry in general, Mr. Mitford said, it must be of interest to know that for every £100,000 the company spent in construction operations £90,000 went out in the payment of labour. Tankage, condensers, brickwork, steelwork, motors, briquetting plants and refinery were all, by their nature, equipment that called for much labour. Continuous work, almost day and night, had been going on in the company's laboratory. Coal from every coal-bearing country in the world had been tested, and while the plant had been under test visitors had come from the Dominions and Colonies and the coal-bearing countries in Europe and elsewhere. The foreign rights covering the company's process were under option in eleven countries.

For the past year the laboratory had been carrying out experiments with a particular cut of oil, and the result was that they had now ready for the market, a Diesel oil made direct from coal. In these days of depression in the coal industry, and with the tremendous strides in the use of Diesel engines, it was a national blessing to find that Diesel oil could be so readily obtained from coal—our great natural resource. The company was producing also a new smokeless fuel.

Housewarming at Nobel House

A New Factory for Suffolk

THE directors of Nobel Chemical Finishes, Ltd., held a small housewarming party on Wednesday to celebrate the transfer of the company's administrative headquarters from Slough to Nobel House, Buckingham Gate. The change over, to which reference was made in THE CHEMICAL AGE of September 28, has been necessitated by the remarkable growth of the company's activities, and it is a forerunner of another and equally important expansion of the manufacturing side. In 1926 Nobel Chemical Finishes was formed as a subsidiary of Nobel Industries to manufacture cellulose finishes, and both it and the parent company operated for some time from the same offices in a portion of the present Nobel House. In 1928, Nobel Industries, as part of Imperial Chemical Industries, Ltd., moved to its present home at Imperial Chemical House, Millbank. This month, nine years after its formation, the subsidiary has returned to occupy the whole of Nobel House, which has been completely modernised and which, at present, houses about 200 members of the staff. Further transfers are to be made from Slough as soon as the renovations and redecorations now in hand are completed.

From 1929 until a few months ago, Nobel House was unoccupied, but it has now been entirely overhauled and equipped with the latest facilities for conducting a business which has become world-wide in its ramifications. While special departments will be set apart for the practical demonstration of the company's finishes, the whole building has been treated with its own products. Coupled with tasteful furnishings, the whole effect is decidedly pleasing.

The manufacturing headquarters of the company are to be moved from Slough to Stowmarket, Suffolk, where a large factory with a frontage of nearly two miles is being built. Full production is planned to commence as soon as the engineering work is completed, and, further to this big addition, new buildings are being erected and plant installed at the company's other factories at Slough, Birmingham and Derby. This provides an excellent example of the steady and increasing demand that there has been for cellulose and synthetic finishes ever since they were put on the market. It is not too much to say that these new synthetic finishes and paints have set improved standards of appearance and durability in every industry which has adopted them. Road and rail transport, and the building, printing, heating, cooking, refrigerating and electrical trades are now amongst the principal users. They have benefited manufacturers of almost every modern product from hats to furniture, and from tin printing to boots and shoes.

The China Clay Industry

Future Prospects

THE present position and future prospects of the china clay industry from a national point of view was dealt with in plain terms by the independent chairman, Mr. W. Prescott, at the third annual meeting of the British China Clay Producers' Federation at St. Austell last week. Mr. Prescot declared that it was time the industry took stock of future possibilities, in regard to which there were three outstanding points: (1) The very great growth of nationalism, leading to the development of national production; (2) The absolute necessity for a commonly accepted commercial policy; (3) The creation of a commercial entity representing the industry, which could enter into arrangements on behalf of the industry with the chief producing units of other nationals.

The prospects of the industry, Mr. Prescott said, were in his opinion anything but bright. There seemed to be no immediate development of consumption industries beyond those major consumptions of pottery and paper. The industry as a whole would have to face the problem of further use for the product. In all probability it would have to face the problem of standardisation, for it was possible that consumers of china clay might decide upon purchase by specification. There was a fight before the industry, and it could only be successful if it was a co-ordinated fight. "It is my firm belief," said Mr. Prescott in conclusion, "that prosperity can return to the china clay industry as a whole, but I cannot see how this can return without great travail, unless it is created by a corporate effort."

Pharmaceutical Training

49th Session of the Pharmaceutical Society's School

STUDENTS past and present thronged the hall of the Pharmaceutical Society on October 2 on the occasion of the opening of the ninety-fourth session of the school. Diplomas and prizes won during the last twelve months were handed to successful candidates by the president. At the conclusion of the prize-giving, the Dean read a very cheerful report of the work at the Society's college and gave some reflections on its happy and industrious atmosphere. He said that in many scholastic centres there was a time when a student could please himself whether he learned anything or not, but clearly the Society's tutors made themselves responsible for seeing that work was done. Experience went to show that in the long run pupils were grateful for their being kept to the grindstone. Research work was going on in five departments of the college and six students were working for the degree of Ph.D.

Sir Frederick Hopkins's Inaugural Address

Sir Frederick Hopkins then gave his inaugural address. He said he was impressed with the extent of the activities and with the changes in the curricula of the school. The Society was making changes of great importance. He wondered how soon the vocational element would enter into teaching and thought that a specialised intellectual background was necessary before they started their calling. He had been in direct contact with medical students for the last fifty years, and they were always convinced that the three years they had to spend on chemical studies presented a painful delay to their realities. He expected that pharmaceutical students had analogous feelings.

Dealing with his own researches in the discovery of vitamines, Sir Frederick said that vitamines were hormones which the body was unable to make for itself. The whole subject had been very highly commercialised and he thought that the introduction of animal physiology into the courses at the college was justifiable. Sir Frederick concluded his address with some remarks on the value of research and said that where research was absent teaching became stereotyped.

After a vote of thanks had been proposed to Sir Frederick by Professor H. E. Armstrong the meeting terminated.

Electrodeposition Exhibition

Forthcoming Soiree

THE Electrodepositors' Technical Society, which has been responsible for the organisation of this exhibition in the Science Museum at South Kensington, will hold a Soirée in the Museum on Friday, October 18. The exhibition will be open from 6.15 to 10.30 p.m., during which time a lecture will be given by Mr. S. Field, A.R.C.S., on progress in electrodeposition and a film will be shown dealing with commercial applications of electrodeposits. Admission to the museum will be by ticket. The Society welcomes applications from members of kindred societies and institutions and from others interested in the theory or practice or applications of electrodeposition, but the number of tickets now available is strictly limited and all applications should be made at once to Capt. A. I. Wynne-Williams, 12A Raleigh House, Larkhall Estate, London, S.W.8.

THE important business in Aden of supplying fuel oil bunkers shows a further expansion. During the first six months of 1935 a total of 867 vessels of 3,565,901 tons called, as compared with 848 of 3,444,332 tons in the same period of 1934; part of the increase was the result of more frequent calls by Italian vessels. Imports of fuel oil in the first five months totalled 273,956 tons, valued at 6,734,360 rupees, as against 266,888 and 6,672,200 respectively in the same period of 1934. The production of salt by evaporation of sea water, Aden's largest industry, continued to increase, as indicated by exports; these shipments (almost exclusively to India, which accords preferential treatment) totalled 128,952 long tons, valued at 1,302,340 rupees, in the first five months of 1935, as contrasted with 117,158 and 1,178,105 respectively a year earlier. The rupee is currently quoted around $0.377.

Notes and Reports from the Societies

Society of Chemical Industry

London Section: Developments in Dyestuffs

THE opening meeting of the 1935-36 session of the London Section of the Society of Chemical Industry was held at Burlington House on October 7. Dr. H. E. Cox, who was elected chairman of the Section earlier in the year, was in the chair.

Dr. R. Fraser Thompson, of the Dyestuffs Group of Imperial Chemical Industries, gave a lecture on "Recent Developments in Dyestuffs," but began by saying that the title was something of a misnomer and that he really ought to apologise for dealing with a very small section of the subject of dyestuffs. He proposed to deal with vat dyestuffs and only with one small section of that field, *viz.*, vat dyestuffs containing nothing but carbon, hydrogen and oxygen. That substances of this type should be coloured at all, he said, was a sufficiently surprising fact because 30 years ago no one would have said that dyestuffs of this type would be obtained by means of constitutions such as he intended to describe. Colouring matters containing only carbon, hydrogen and oxygen were quite small in number and in some respects the subject was still yet in its infancy, and the idea that indigo in vat dyestuffs would have been replaced by substances containing only carbon, hydrogen and oxygen would, some time ago, have been regarded as an Utopian idea. Now, however, a series of colouring matters could be made, the fundamental principle being that benzene rings were fused together as completely as possible, and the more compact the structure in general the more useful was the product formed.

By means of demonstration on the blackboard and actual experiments, Dr. Thompson dealt with a series of colours having pyrene and perolyne as their base and showed, in the case of pyrene, how the derivatives were yellow or orange in colour in the first place, but by suitable arrangement of the benzene rings and subsequent halogenation not only were colours which in the first place had no affinity for fibre given a very high affinity, but the colours were deepened considerably. For instance, it was shown that dibenzoprenequinone ($C_{22}H_{12}O_2$) was yellow, that anthanthrone ($C_{22}H_{10}O_2$) was pale yellow and pyranthrone ($C_{30}H_{14}O_2$) was golden yellow. It was pointed out that in the case of the first of these substances it had no affinity for fibre, and whereas in the other two cases there was a good affinity, this was consedirably increased by the addition of halogen atoms such as propine and bromine.

Derivatives of Perolyne

Dealing with a series of derivatives of perolyne, the same characteristics were demonstrated, and it was pointed out that the perolyne derivatives had been discovered during the last year or two by Professor Heilbron in this country. The affinity in the first case was practically negligible in the commercial sense, and it was necessary to have a more complex structure before affinity began to appear. Thus dibenzoperylenequinone ($C_{28}H_{14}O_2$), a red violet, had no affinity for fibre, whilst dibenzanthrone ($C_{34}H_{16}O_2$), a dark blue at first but changed to a purple by halogenation, had a high affinity. Isodibenzanthrone ($C_{34}H_{16}O_2$), a purple changed to violet by halogenation, had a very high affinity; dimethyoxydibenzanthrone ($C_{36}H_{20}O_4$), a jade green converted to emerald by halogenation, had a very good affinity, and dimethoxyisodibenzanthrone, a blue not changed by halogen also had a very good affinity. Dr. Frazer Thompson remarked that the real explanation of these changes had yet to come, but it all depended on the halogen molecule being in certain positions.

Professor A. Green thanked Dr. Frazer Thompson for his extremely interesting exposition of this interesting branch of vat chemistry, adding that we must admit that we were still at the knees of the German chemists in this matter. Our industry was a comparatively young one compared with the German industry because it was no more than 15 years old, whereas the German industry was very much older and the experience of German chemists was therefore very much greater. In spite of that, however, it could be claimed that we in this country had struck out in a somewhat novel direction, and what Dr. Thomson had said was an excellent example of originality which he hoped we should see extended in the future. There were other directions in dyestuffs chemistry in which we had been able to show the lead, and definitely in the dyestuffs used for dyeing acetate silk we had more than held our own up to the present. Indeed, it could be claimed that all the methods which had been used for the manufacture of such dyestuffs were the result of original investigations in this country. Therefore he felt we could look forward to a time when the whole of the vat dyestuffs industry in this country would stand on an equal footing with the German industry and it was a source of satisfaction that Dr. Thompson had shown we were not wanting in originality. One important point in this connection was the question of giving satisfactory rewards for originality. The German dyestuff firms gave large pecuniary rewards to the men in their organisation who made important discoveries, and although this might be a little more difficult now that such work was done largely in teams, there was always one brain directing those teams, and if such leadership was suitably acknowledged we were likely to get a great deal more done.

Glasgow Section: Ramsay Chemical Dinner

THE Ramsay Chemical Dinner will be held this year at the Central Station Hotel, Glasgow, on Friday, December 6. Sir Thomas Holland, F.R.S., will occupy the chair. This dinner, which grows in popularity every year and brings together a large number of scientists from all parts of the British Isles, is organised by the Glasgow Section of the Society of Chemical Industry, the Chemical Society and other allied bodies in memory of Sir William Ramsay. Further information is obtainable from Mr. H. C. Moir, 116 Paton Street, Glasgow.

Edinburgh Section: Smoke Abatement

THE serious effects of smoke-laden atmosphere and scientific means of overcoming this menace to public health were discussed at a meeting of the Edinburgh and East of Scotland Sections of the Society of Chemical Industry and the Institute of Chemistry in Edinburgh on October 8.

While meticulous care is bestowed on the control of the purity of food and water for our consumption, little control is exercised over the purity of far more essential "free air," complained Lt.-Col. John du P. Langrishe, lecturer in public health at Edinburgh University, one of the principal speakers on smoke-abatement from the point of view of public health. He went on to say that statistical evidence showed a close relationship between death rates and atmospheric conditions.

In addition, amongst the effects of the obstruction of visible radiations was that of loss of actual visibility. Out of doors, the smoke pall was a constant source of menace to human safety, whether by road, by rail or by air; indoors, reduction of visibility caused an increase of 25 per cent. in industrial accidents, while the compensatory use of artificial illumination had been shown to be accompanied by a reduction of 11 per cent. in output. This loss of visibility was accentuated by the deposit of soot and tar on windows. Psychological ill-effects were inter-related with the physiological; smoke gloom lessened the potential reserve, working power and well-being of the individual; it increased fatigue, irritability and restlessness; gloom without made for gloom within and induced mental depression.

The speaker went on to deal with "the remote yet highly important" influence on human health of the action of smoke on vegetation. He said it has been shown that pasturage in the neighbourhood of the industrial towns in Lancashire, which at one time supported two beasts to the acre, can now carry only one beast to three acres, while the milk of such cows is deficient in calcium. This is a very serious thing for children, whose diet consists so largely of milk, for if their food is deficient in calcium, then not only is their growth retarded, but, worse still, they are liable to suffer from rickets.

The problem of atmospheric pollution from coal smoke still remains unsolved, stated Dr. Birkett Wylam, of the Department of Health for Scotland, another speaker. Much had been done and said to arouse the public to a fuller realisation of the dangers of a smoke-polluted atmosphere, and the champion of smoke-abatement, who in the past was regarded as a crank, was now looked upon more as a man with a message. "It had been stated," went on Dr. Wylam, "with a great deal of justification, that the problem of pollution from industrial smoke has been largely solved and that the main offender is the domestic consumer. The domestic

fireplace probably causes about two and a half times as much smoke pollution as the factory chimney, in spite of the fact that the domestic coal consumption is less than half of the total. The large industrial consumer must, for reasons of economy, obtain the most efficient combustion possible, and a smoky chimney represents unnecessary expense." The small boiler plant or factory was probably the worst industrial offender from the point of view of smoke emission. Often the plant was not of the most up-to-date type and the fuel the cheapest procurable. The suppression of this offence lay with the local authorities and a vigorous campaign against undue smoke was usually successful if combined with tactful persuasion and assistance.

Manchester Section : Coal Research and the Coal Industry

THE opening meeting of the 1935-36 session of the Manchester Section of the Society of Chemical Industry was held at the Engineers' Club, Manchester, on October 4, when the chairman, Mr. A. McCulloch, M.Sc., read a paper entitled "Some Coal Researches—their Significance to the Coal Industry."

In his opening remarks, Mr. McCulloch discussed the nature and scope of research in connection with coal, and advanced some explanations for the *laissez-faire* attitude adopted by the coal owner towards pure coal research. The formation of coal from plant débris was viewed as a progressive process of condensation, which, finally, resulted in the production of anthracite. The significance of the condensation process was explained in terms of Seyler's classification, and the utility of this classification to determine the combustion characteristics was demonstrated. The lecturer then pointed out the limits of such a system of classification by describing the various classes of substances which are now recognisable in bituminous coals. The chemical constitution of the class of bodies generally known as the " ulmin " constituents was discussed at length. These are the preponderating constituents. They exhibit colloidal properties, and their chemical structure varies in different types of coal.

In considering the action of chemical solvents and of heat on coal these two facts must always be kept in mind. Progress in pure coal research having been surveyed, it was concluded that the progress made up to the present time allowed of the adoption of a broad conception of coal structure, whose implications were valuable in qualifying the interpretation of the results of previous experimental work and in determining future programmes of research. As an indication of the value of pure coal research a process for the preparation of a high-grade activated carbon from coal by chlorination, preceding carbonisation and activation, was described. This process is based on the discovery that the complete chlorination of coal destroys entirely its tar-producing properties. Finally, a plea was put forward for the coal industry to embark upon a considered scheme of coal research which would allow for team-work for a reasonable number of years.

A cordial vote of thanks, proposed by Dr. R. H. Pickard, F.R.S., seconded by Dr. T. Callan, was accorded the chairman for his stimulating address.

The Institute of Fuel

Melchett Lecture

ACCORDING to Mr. Harry R. Richards, F.R.S., who delivered the Melchett Lecture to the members of the Institute of Fuel and other societies, at the Geological Society's Rooms, Burlington House, London, on October 9, the progress of the internal combustion engine has been one of the most startling developments of the last 50 years. It appeared so soon as a suitable fuel was available. At first it used gas and sat still, then petrol appeared and at once it began to run about, and, later, to grow wings. Within a few years it has revolutionised all forms of transport, except the railways, for these are ever haunted by the ghost of George Stephenson, who might shake his head and rattle his chains at the mere suggestion of anything more modern or efficient than a non-condensing steam engine. To-day, however, well over 80 per cent. of the total power output of all forms of prime mover uses petrol as its fuel.

By scientific blending of fuels from the various sources of supply, by the addition of lead tetra-ethyl, benzole or alcohol, the octane number of fuels has risen steadily year by year, and as it has risen, so has the performance of the petrol engine marched accordingly. The reflection of the use of high octane or non-detonating fuels upon engine performance can best be seen in the field of aircraft engines. In 1920, the best petrol for aircraft engines allowed only of a compression ratio of less than 5.0 : 1 with no supercharge. To-day, with fuels of an octane number of 87 or thereabouts, we can employ a compression ratio of well over 6 : 1 and can superimpose on this a very considerable supercharge, with the net result that developments of the last 50 years. It appeared so soon as a we can now operate throughout a prolonged test with brake mean effective pressures as high as 185 lb. per sq. in., and attain, under cruising conditions, a fuel consumption as low as 0.44 lb. per b.h.p. hour, and this with a specific weight of only about 1.3 lb. per horse power reckoned on the ground level or takeoff power. If, as seems likely, the octane number of aviation fuels is to be increased in the near future, the performance of petrol aviation engines will receive a further very large impetus.

With regard to fuels in general, a moderately high, but not too high, cetene value is advantageous, in that it serves to shorten the delay period and thus allow of a better control over the rate of burning and of pressure rise. As in the case of petrol, the cetene value of various fuels depends mainly on their source of origin, but it can be varied somewhat by varying the distillation range or by doping with such substances as amyl nitrite, ethyl nitrate or certain peroxides. Generally speaking, any source which yields a bad, that is a low, octane petrol, will yield a high cetene diesel oil, and *vice versa*. As to volatility in general, within limits the lower the volatility the better, since too volatile a fuel is liable both to cause detonation and to give rise to gassing troubles in the fuel injection system. At the other end of the scale, if the volatility be too low, a further delay period will be introduced, due to the greater time taken to form a gas envelope on the outside surface of the droplets, as has been pointed out by Boerlage and Broeze. We are still a long way off any cut-and-dried specification for diesel fuels for the reason that the different types of high-speed diesel engines have such widely differing tastes—some require strict dieting, others can enjoy the whole of the menu.

British Association of Chemists

Liverpool Section : Discussion on Poisons Act

A PLEASANT function provided the main item of interest at a meeting of the Liverpool Section of the British Association of Chemists', at the Victoria Hotel, Liverpool, on October 2, when an electric clock was presented to the late secretary, Mr. A. Betton, who served in this capacity for the past five years. Mr. H. P. Minton, in making the presentation, said it was a " heaven-sent inspiration" on the part of some member unknown to suggest that Mr. Betton should be asked to take over the duties of hon. secretary, although in saying so he did not wish to detract from the work of their present chairman—Mr. Betton's predecessor. He was only expressing the wishes of the section when he hoped that the clock would register a good time for him for many years to come. In response, Mr. Betton thanked the members for their kindly thought.

After Mr. E. Myers, the hon. secretary, had dealt generally with the season's programme, a discussion took place on the Association's position in respect to the Pharmacy and Poisons Act and the recently published Regulations. Mr. L. Wild, the chairman, remarked that he understood the position at present was that the Home Secretary would receive a deputation from the Association. Mr. Minton suggested that members could do far more individually by writing to their respective M.P.'s than by approaching them as an association; M.P.'s were bound to take notice of letters from constituents, but could ignore correspondence from associations as a whole. A member remarked that their point was that Institute men were no more qualified to deal with that class of material than they were. It was also pointed out by another member that the regulations had been tabled and they could not do anything now except make an appeal to the Crown.

Mr. Myers said he looked forward to the day when their profession would become a closed one and they would have a register of chemists. Neither of the other chemist organisations had done so much for the personal welfare of chemists; they were mainly concerned with the dissemination of chemical knowledge.

Mr. Wild remarked that he looked forward to the day when all chemists would be in the British Association of Chemists.

Mr. Minton said chemists should know that the B.A.C. had disbursed more in twelve months in unemployment assistance and general aid than other chemical bodies had disbursed in five years. Their influence was extending and they had now reached the stage where no foreign chemist could be introduced by a firm in this country if the B.A.C. had an equally suitable man available. Even where they had no suitable chemist available, the Home Office would only grant a permit to a foreign chemist for either six or twelve months. When his permit came up for renewal at the end of this period, it would be refused if the B.A.C. then had a suitable man available.

Society of Public Analysts

Election of New Members

An ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on October 2, the president, Mr. John Evans, being in the chair. Certificates were read in favour of:—W. R. Bage, A. R. Bonham, H. C. P. Chapleau, L. Cooksey, D. E. Davis, F. Ellington, E. O. Heinrich, J. A. D. Hickson, D. R. Jackson, D. C. Macpherson, F. E. Murphy, T. C. J. Ovenston, G. H. Stott, B. C. L. Summers and S. G. Willimott. The following were elected members of the Society:—F. H. Milner, L. C. Nickolls, C. P. Stewart, S. L. Tompsett.

In a paper on "The Chemical Examination of Furs in Relation to Dermatitis. Part VI.—The Identification of Vegetable and other Dyes," by H. E. Cox, it was stated that since the natural pigments in furs are in medullary cells within the fibre, they are more resistant to chemical reagents than artificial dyes, which are near the surface. The vegetable dyes commonly used for furs include logwood, quercetrin, fustic catechin, turmeric, and tannins, with various mordants. They may be separated from the fibres by boiling (i) with dilute hydrochloric acid, and (ii) with sodium formaldehyde-sulphoxylate, and identified in the extracts.

Testing for Sea-Water Damage

W. M. Seaber, in a paper on "Testing for Sea Water Damage," said that when testing objects for damage by sea water in connection with insurance claims, it is helpful to treat an undamaged portion of the material with sea water or 3 per cent. salt solution, to ascertain what amount it can absorb. The effect of splashes may be ascertained by treating portions of wrapping fabrics with dilute silver nitrate solution, rinsing them, and exposing them to the light. A judgment as to the extent of damage by sea water (if any) may be formed from the results of quantitative tests for chlorine and bromine. A simple apparatus has been devised for the estimation of bromine by the fluorescein test-paper method, the resulting stain being compared with standard stains prepared from known quantities of bromide.

F. L. Okell and John Lumsden, reading some "Notes on the Iodometric Titration of Tin," showed that the amount of oxygen in the air dissolved in standard iodine solution is sufficient to cause a considerable error in the titration results, even when the iodine solution has been standardised against tin. Another source of error in the assay of tin in its ores is the presence of titanium, which causes the results to be too high. If, however, the iodine solution is free from air, accurate results may be obtained without removing the titanium.

Continental Chemical Notes

Roumania

The Securit Company has been registered in Bucharest for the production of non-splintering glass.

France

Organic salts of calcium recently found to be applicable for subcutaneous or intramuscular injection in place of calcium gluconate include the xylonate and galactonate. According to Lumière and Brun, both these salts possess very low toxicity, up to 0.75 grams per kilogram of animal weight being without appreciable detrimental action upon guinea pigs ("Comp. rend Soc. Biol.," 1935, No. 14, p. 1453).

Methods for the preparation of trisodium periodate and of periodic acid were recently published by Lange and Paris ("J. Pharm. Chim.," 1935, No. 8, p. 403). To prepare the trisodium salt, 50 grams pure and dry potassium iodide and 600 c.c. sodium carbonate (density 1.332) in a pyrex flask are dissolved in enough distilled water to bring the volume to 2,000 c.c. and the solution heated with a bare flame to 80° C. before adding 80 c.c. pure bromine through a tube dipping below the surface. At a certain moment an abundant precipitate of the periodate suddenly appears, at which stage the liquid is decanted. The whole process occupies 30 to 45 minutes. The precipitate is collected on a Buchner funnel and washed three to four times with a total quantity of 200 c.c. water which is distributed uniformly drop by drop over the precipitate. After each addition of liquid, the pump is cut off and the mass allowed to soak for 15 minutes. Filtration is finally effected very slowly. The filtrate should not contain any traces of sodium bromide or iodide. The cake of crystals is detached from the filter and pressed between several thicknesses of filtrate paper before drying in the air and packing into a dry bottle. Sodium periodate is used for preparing the free acid. A weighed quantity of the salt is dissolved in a slight excess of normal nitric acid. A cold solution of silver nitrate (quantity sufficient to produce the disilver periodate) dissolved in the minimum quantity of water is poured into the periodate solution, the resulting precipitate being collected upon a Gooch crucible where it is washed with the minimum quantity of water. While still moist the precipitate is suspended in a little water in a large flask containing fragments of glass. The temperature is brought to about 70° C. by heating with the bare flame and small amounts of bromine added to the suspension with vigorous shaking, the additions being continued until the precipitate turns lemon yellow and no further rise in temperature occurs. The precipitate is finally collected upon glass wool and the mother liquor containing periodic acid solution is treated with a current of air under reduced pressure to remove excessive bromine. The solution is finally evaporated in a vacuum dessicator in the presence of concentrated sulphuric acid.

Russia

Polymerisation of vegetable drying oils is claimed to be accelerated after addition of 0.2 to 1 per cent. of mercaptobenzothiazole and 0.1 to 0.5 per cent. of diphenylguanidine. Calcium resinate may also be present but is not essential. Substances mentioned by the same inventor as retarding the rate of polymerisation include linoleic acid (up to 1 per cent.) and resinates or linoleates of mercury, copper, strontium and barium. All these function in the absence of calcium resinate (Russian Pat. 34,669).

In trials on the subterranean gasification of coal now proceeding in the Moscow mining area, water gas has been produced by alternate blowing with air and steam. It is hoped to use this method on an industrial scale.

A recently patented method for preparing 8-hydroxy quinoline involves heating 8-chloroquinoline at 200° to 300° C. in aqueous alkaline solution in an autoclave in the presence of metallic copper or a copper compound. Separation of the reduction product from the reaction mixture is effected by usual methods (Russian Pat. 38,152).

A new method for conversion of guaiacol into vanillin consists in reaction with formaldehyde in the presence of ferrous sulphate and sulphophenylhydroxylamine. The latter is obtained by electrolytic reduction of nitrobenzene sulphonic acid. The formaldehyde is added gradually to the guaiacol in aqueous alcohol after the other ingredients have been incorporated (Russian Pat. 37,704).

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no changes to report in the markets for heavy chemicals, wood distillation products, perfumery chemicals and essential oils, but there have been some slight variations in the prices of certain rubber chemicals, coal tar products and pharmaceutical products. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—The good steady demand continues with prices firm. All lead products are advancing in price owing to the several rises in the price of lead. In the coal tar products section prices remain unchanged from last week.

MANCHESTER.—Generally firm price conditions have been reported this week on the Manchester chemical market. The tendency is undoubtedly strong and little recession is looked for. In some directions a sprinkling of forward buying has been met with, but it is rather early yet to look for any general contracting. Traders on this market have experienced no noticeable consequences of the political uncertainty; there has been no falling off in the rate at which chemicals are being taken up against contracts in the district, the alkali products and the heavy acids, in particular, moving fairly freely into consumption. The chemical requirements of the textile dyeing and finishing trades are keeping up, though there is room for a good deal of improvement. Among the by-products, pitch is only moderately active and not too strong, but in most other directions values are firm, with the light distillates in good demand.

SCOTLAND.—There has been an improved demand for chemicals for home trade during the week, and rather more inquiry for export. Prices generally are very firm, several articles being dearer. Red lead and litharge have advanced a further £1 per ton.

Price Changes

Rubber Chemicals.—ANTIMONY SULPHIDE, golden, 6½d. to 1s. 1d. per lb.; CADMIUM SULPHIDE, 4s. 10d. to 5s. 1d. per lb.; LITHOPONE, 40%, £16 10s. to £17 10s. per ton.

Tar Products.—TOLUOL, 90%, 1s. 11d. to 2s. per gal.; XYLOL, 2s. per gal., pure, 2s. 2d. to 2s. 3d. per gal.

Pharmaceutical and Photographic Materials.—ACID, TARTARIC, 1s. per lb.

Intermediates.—NITRONAPHTHALENE, 10d. per lb.

All other prices remain unchanged.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals, £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7: dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash. £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered. £23 ex wharf. MANCHESTER: White powdered Cornish, £21 to £22, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—4s. 10d. to 5s. 1d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4⅞d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD, ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36; brown, £33 10s.

LEAD NITRATE.—£28 to £29 per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £41 10s.

LITHOPONE.—30%, £16 10s. to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—6¾d. to 7½d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £40.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d. to 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb.

SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.
SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£21 10s. per ton. LONDON: £22. SCOTLAND: £20 15s.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3⅝d. per lb.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.
SULPHATE OF COPPER.—MANCHESTER: £14 2s. 6d. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINZ SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7d. to 7¼d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s . 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%. 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5¼d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%. 11d. to 1s. 1d. LONDON: Solvent. 1s. 3½d. to 1s. 4½d.; heavy. 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%. 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PYRIDINE.—90/140%, 5s. 3d. to 8s. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 4d.
XYLOL.—Commercial 2s. per gal.; pure, 2s. 2d. to 2s. 3d.
PITCH.—Medium, soft, 32s. 6d. per ton, in bulk at makers' works.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.
m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—10d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £9. Grey, £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey £11 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
METHYL ACETONE.—46-50%, £43 to £47 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.
WOOD TAR.—£2 to £4 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price has been announced at £7 5s. per ton, less 7s. 6d. for October delivery, neutral quality basis 60.6% nitrogen in 6-ton lots delivered to farmer's nearest station.
CALCIUM CYANAMIDE.—The price for October delivery is £6 17s. 6d. per ton delivered in 4-ton lots.
NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.
NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station, all terms and conditions the same as for the season 1934/35.
CONCENTRATED COMPLETE AND NITROGEN PHOSPHATE FERTILISERS.—It has been announced that these products are at present obtainable at last season's prices so far as existing stocks permit, provided delivery is taken before November 30, 1935.

Latest Oil Prices

LONDON, Oct. 9.—LINSEED OIL was steady. Spot, £28 15s. per ton (small quantities); Oct., £26 5s.; Nov.-Dec., £26 10s.; Jan.-April, £26 17s. 6d.; May-Aug., £27 2s. 6d., naked. SOYA BEAN OIL was firm. Oriental (bulk), Oct. shipment, £23 per ton. RAPE OIL was steady. Crude, extracted, £36 10s. per ton; technical refined, £38, naked, ex wharf. COTTON OIL was firm. Egyptian crude, £25 10s. per ton; refined common edible, £29 10s.; and deodorised, £31 1/s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was dearer. American, spot, 44s. 9d. per cwt.

HULL.—LINSEED OIL.—Spot was quoted at £27 5s. per ton; Oct., £26 7s. 6d.; Nov.-Dec., £26 10s.; Jan.-April, £26 15s.; May-Aug., £27. COTTON OIL.—Egyptian crude, spot, £26 per ton; edible, refined, spot, £29; technical, spot, £29; deodorised, £31, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £22 10s.. per ton, naked. GROUNDNUT OIL.—Extracted, spot, £33 10s. per ton; deodorised, £36 10s. RAPE OIL, extracted, spot, £35 10s. per ton; refined, £37. ROYA OIL, extracted, spot, £28 per ton; deodorised, £31. COD OIL.—F.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL.—Pharmaceutical 45s. per cwt.; first, 40s.; second, 38s. TURPENTINE, American, spot, 46s. 9d. per cwt.

Chemical and Allied Stocks and Shares

Current Quotations

The following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	Oct. 8.	Oct. 1.
Anglo-Iranian Oil Co., Ltd. Ord.	61/3	60/-
,, 8% Cum. Pref.	33/-	33/6
,, 9% Cum. Pref.	35/-	35/-
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	4/0¾	4/0¾
Associated Portland Cement Manufacturers, Ltd. Ord.	56/6	57/-
,, 5½% Cum. Pref.	27/-	27/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	62/6	62/6
Bleachers' Association, Ltd. Ord.	5/3	5/6
,, 5½% Cum. Pref.	9/0¾	9/0¾
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	48/-	48/6
Borax Consolidated, Ltd. Pfd. Ord. (£)	97/6	97/6
,, Defd. Ord.	16/9	17/-
,, 5½% Cum. Pref. (£10)	£11	£11/5/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£104	£104
Bradford Dyers' Association, Ltd. Ord.	8/1½	8/1½
,, 5% Cum. Pref.	10/7½	10/7½
,, 4% 1st Mort. Perp. Deb. (£100)	£88	£88
British Celanese, Ltd. 7% 1st Cum. Pref.	24/6	24/7½
,, 7½% Part. 2nd Cum. Pref.	21/3	21/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/-	5/-
,, 4% 1st Mort. Deb. Red. (£100)	£90	£90
British Cyanides Co., Ltd. Ord. (2/-)	3/-	3/-
British Drug Houses, Ltd. Ord.	20/-	20/-
,, 5% Cum. Pref.	21/3	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	5/9	5/9
,, 8% Pref. (Cum. and Part.)	27/6	27/6
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	46/3	46/3
,, 5½% Cum. Pref.	26/3	26/3
,, 4¼% First. Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	107/6	105/-
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	95/-	96/3
,, 6% Cum. Pref.	29/-	29/-
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	17/6	18/1½
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	7/6	7/6
,, 5% Pref. (Cum.)	12/6	13/1½
Cellulose Acetate Silk Co., Ltd. Ord.	12/6	13/9
,, Deferred (1/-)	2/1½	2/4½
Consett Iron Co., Ltd. Ord.	11/-	10/6
,, 8% Pref.	27/6	27/6
,, 6% First Deb. stock, Red. (£100)	£106	£106
Cooper, McDougal & Robertson, Ltd. Ord.	32/6	32/6
,, 7% Cum. Pref.	28/9	28/9
Courtaulds, Ltd. Ord.	53/1½	53/1½
,, 5% Cum.	25/-	25/7½
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	29/4½	30/-
,, 7½% "A" Cum. Pref.	30/-	31/10½
Distillers Co., Ltd. Ord.	90/-	91/6
,, 6% Pref. Stock Cum.	29/9	29/6
Dorman Long & Co., Ltd. Ord.	19/9	20/-
,, Prefd. Ord.	30/-	30/-
,, 6½% Non-Cum. 1st Pref.	22/3	22/3
,, 8% Non-Cum. 2nd Pref.	20/3	20/3
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£102	£103
English Velvet & Cord Dyers' Association, Ltd. Ord.	4/4½	4/4½
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/1½	38/1½
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£107	£107
Gas Light & Coke Co. Ord.	26/3	26/6
,, 3½% Maximum Stock (£100)	£90	£90/10/-
,, 4% Consolidated Pref. Stock (£100)	£106/10/-	£107/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£86	£89/10/-
,, 5% Deb. Stock, Red. (£100)	£116	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£114	£114/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	13/1½	13/1½
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	30/-	30/-
Imperial Chemical Industries, Ltd., Ord.	34/9	34/-
,, Deferred (10/-)	8/3	8/1½
,, 7% Cum. Pref.	31/9	31/6
Imperial Smelting Corporation, Ltd. Ord.	14/-	14/-
,, 6½% Pref. (Cum.)	23/9	23/9
International Nickel Co. of Canada, Ltd. Cum.	$31⅝	$30⅝
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	108/9	107/6
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	6/3	6/3
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	30/-	30/-
,, 8% Cum. "A" Pref.	31/-	31/-
,, 20% Cum. Prefd. Ord.	76/10½	76/10½
,, 5% Cons. Deb. (£100)	£106	£107
,, 4% Cons. Deb. (£100)	£103	£104
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£40	£50
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum.. Pref.	1/3	1/3
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	38/6	39/6
,, 1st Pref. 6½% Cum.	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£64/10/-	£65/10/-
Reckitt & Sons, Ltd. Ord.	107/6	111/3
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	40/-	43/9
,, Pref.	46/3	46/3
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£122/10/-	£125/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£107	£108/10/-
,, Perpetual 3% Deb. (£100)	86	£90
,, 5% Red. Deb. 1950-60 (£100)	£115/10/-	£115/10/-
Staveley Coal & Iron Co., Ltd. Ord.	46/10½	46/3
Stevenson & Howell, Ltd. 6¼% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	71/3	73/1½
Unilever, Ltd. Ord.	27/6	28/9
,, 7% Cum. Pref.	27/9	28/3
United Glass Bottle Manufacturers, Ltd. Ord.	38/-	39/-
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd Ord. (6/8)	18/9	18/9
,, 6% Cum. Pref.	25/-	23/9
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	7/3	7/6
,, 7% Cum. Pref.	23/9	23/9
,, 6% Deb. Red. (£100)	£101	£101

Inventions in the Chemical Industry

Patent Specifications and Applications

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications open to Public Inspection

ELECTROLYTIC MANUFACTURING OF METALLIC MAGNESIUM, method and apparatus.—Y. Kato. March 30, 1934. 1077/35.

POTASSIUM NITRATE, production.—Kali-Forschungs-Anstalt Ges. March 29, 1934. 2411/35.

COMPOUNDED HYDROCARBON LUBRICATING OILS and greases, manufacture.—R. W. Asprey. March 24, 1934. 5344/35.

UNDECYL COMPOUNDS, and method for their production.—Carbide and Carbon Chemicals Corporation. March 31, 1934. 7001/35.

SEPARATION OF WAX from mineral oil by filtration.—Texaco Development Corporation. March 31, 1934. 7734/35.

CYCLIC KETONES, manufacture.—I. G. Farbenindustrie. March 31, 1934. 7811/35.

AMMONIUM NITRATE having a low weight per unit volume, production.—I. G. Farbenindustrie. March 28, 1934. 8131/35.

SOLID MAGNESIUM SULPHATE MONOHYDRATE and similar salts, production.—Metallges, A.-G. March 27, 1934. 8409/35.

SULPHURISING ORGANIC COMPOUNDS having unsaturated linkages of an aliphatic character.—K. W. Posnansky and C. Sandvoss (trading as Dr. Alexander and Posnansky.) March 26, 1934. 8788/35.

OXAZOLE DYESTUFFS of the anthraquinone series, manufacture.—I. G. Farbenindustrie. March 24, 1934. 9293/35.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. March 24, 1934. 9294/35.

COMPLEX COMPOUNDS of organic heavy metal mercapto compounds, manufacture.—Schering-Kahlbaum A.-G. March 29, 1934. 9420/35.

ESTERS, production.—Celluloid Corporation. March 31, 1934. 9545/35.

ESTERS, production.—Celluloid Corporation. March 29, 1934. 9819/35.

EMULSIONS OF BITUMEN, RESINS, WAXES, or the like.—P. Lechler (trading as P. Lechler (firm of)). March 31, 1934. 10131/35.

Specifications Accepted with Date of Application

METHOD OF RECOVERING COMPACT METALLIC MAGNESIUM from magnesium dust and for extracting magnesium from magnesium dust by sublimation.—Oesterreichisch Amerikanische Magnesit A.-G. May 4, 1934. 435,234.

MORDANT DYESTUFFS, manufacture.—Durand and Huguenin A.-G. Dec. 27, 1933. 435,513.

INDUSTRIAL-WASTE LIQUIDS, purification.—E. Nolte, H. J. Meyer, and E. Fromke. March 6, 1934. 435,363.

WATER-SOLUBLE BASIC AZO DYESTUFFS, production.—Deutsche Hydrierwerke A.-G. Feb. 7, 1933. 435,249.

CYANINE DYES, manufacture.—Kodak, Ltd., and B. Beilenson. Dec. 19, 1933. 435,542.

CARBIDES, CARBONITRIDES, NITRIDES, BORIDES, SILICIDES, and titanides, production.—Vereinigte Edelstahl A.-G. Dec. 21, 1932. 435,754.

SYNTHETIC RESINS and their applications.—E. I. du Pont de Nemours and Co. March 21, 1933. 435,762.

WASTE INDUSTRIAL GASES, treatment.—Lodge-Cottrell, Ltd., and J. O. Boving. March 23, 1934. 435,560.

POLYNUCLEAR CYCLIC KETONES, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). March 24, 1934. 435,563.

PHENYLATED, AROMATIC, AND HYDROAROMATIC HYDROCARBONS and derivatives thereof, manufacture.—I. G. Farbenindustrie. March 25, 1933. 435,708.

HYDRATION OF OLEFINES.—G. F. Horsley and Imperial Chemical Industries, Ltd. March 27, 1934. 435,769.

PRODUCTION OF SYNGENITE and production of potassium sulphate from potassium chloride.—Palestine Potash, Ltd. (H. E. Z. Raczkowski and W. Hillkowitz.) March 27, 1934. 435,772.

WATER-INSOLUBLE AZO DYESTUFFS, process for the manufacture. A. Carpmael (I. G. Farbenindustrie). March 27, 1934. 435,711.

AZO DYESTUFFS.—Imperial Chemical Industries, Ltd., and A. H. Knight. March 28, 1934. 435,807.

SPLITTING AND HYDROGENATION of hydrocarbon oils.—W. W. Triggs (Gutehoffnungshütte Oberhausen A.-G.). March 28, 1934. 435,809.

PIGMENT DYESTUFFS, process for the manufacture.—A. Carpmael (I. G. Farbenindustrie). March 29, 1934. 435,817.

CHEMICAL TREATMENT of petroleum oils.—Sharples Specialty Co. May 15, 1933. 435,826.

PROCESS FOR PURIFYING and hydrogenating naphthalene.—Soc. Industrielle des Carburants et Solvants. June 24, 1933. 435,717.

ACID CALCIUM CITRATE, manufacture.—A. H. Bennett. Aug. 24, 1934. 435,586.

CHLORINATED RUBBER, production.—Deutsche Gold-und Silber-Scheideanstalt Vorm. Roessler. Dec. 19, 1933. 435,726.

HALOGENATION PRODUCTS of rubber and like substances, production.—Metallges, A.-G. Jan. 24, 1934. 435,729.

SEPARATION OF MIXTURES comprising water-soluble amino acids and ammonium sulphate.—Ges. für Kohlentechnik. May 18, 18, 1934. 435,839.

LUBRICANTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 17, 1934. 435,597.

EXTRACTION OF HALOGENS from fluids.—Kodak, Ltd. March 31, 1934. 435,738.

CONDENSATION PRODUCTS from trihalogen esters of fatty acids and esters of levulinic acid, production.—Heine and Co., A.-G. Dec. 22, 1934. 435,605.

METALLIC BERYLLIUM and its alloys, preparation.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. April 30, 1934. 435,747.

SYNTHETIC RESINS and their applications.—E. I. du Pont de Nemours and Co. March 21, 1933. 435,796.

Applications for Patents

(September 19 to 25 inclusive.)

CATALYTIC MATERIALS, manufacture.—E. I. du Pont de Nemours and Co. (United States, Sept. 19, '34.) 26021.

ALKALI CELLULOSE, production.—E. I. du Pont de Nemours and Co. (United States, Sept. 19, '34.) 26022.

INSOLUBLE AZO COMPOUNDS.—E. I. du Pont de Nemours and Co. (United States, Sept. 20, '34.) 26177.

FLOTATION OF MINERALS.—E. I. du Pont de Nemours and Co. and S. Lenher. 26579.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 26097.

ORTHO-OXYAZO-DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 18, '34.) 26316.

AZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and Mr. Mendoza. 26164.

DERIVATIVES OF CELLULOSE, ETC., manufacture.—H. F. Oxley. 26340.

OZONE, production.—E. J. and J. R. Quain. 26094.

TREATING ORGANIC WASTE LIQUORS.—E. L. Rinman. 26258.

HYDROARMATIC ALCOHOL.—Rohm and Haas Co. (United States, Oct. 27, '34.) 26279.

SULPHATES OF BARIUM, ETC., production.—Titan Co., Inc. (United States, Sept. 27, '34.) 26355.

(September 26 to October 2 inclusive).

METALLIC CARBONATES, manufacture.—G. Antonoff. 26688.

SUGAR-CANE JUICES, ETC., treatment.—Sir A. E. Aspinall and F. Hardy. 27214.

SULPHUR, recovery.—R. F. Bacon. (United States, Oct. 18, '34.) 26894.

CHLORINATED DERIVATIVES OF DIETHYLETHER, manufacture.—A. Carpmael (I. G. Farbenindustrie). 26668.

WATER-GAS GENERATORS.—H. J. Carson (April 4, '34.) 27081.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

British India.—The British Trade Commissioner at Calcutta reports that the Indian Stores Department is calling for tenders, to be presented in New Delhi by November 18, 1935, for the supply of linseed oil. (Ref. T.Y. 105.)

British India.—The British Trade Commissioner at Calcutta reports that the Indian Stores Department is calling for tenders (Order No. M. 6472), to be presented in New Delhi by November 11, 1935, for the supply of turpentine, white spirit and rosin during the period March 1, 1936, to February 28, 1937. (Ref. T.Y. 103.)

Belgium.—A buyer in the technical department of an important Belgian company established at Brussels wishes to obtain the representation; on terms to be arranged, of United Kingdom manufacturers of industrial plant and equipment for oil mills, pumps, presses for all industries, and laboratory instruments. (Ref. No. 336.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Ministry of Agriculture is calling for tenders, to be presented in Egypt by December 11, 1935, for the supply of laboratory apparatus. (Ref. T.Y. 10,158.)

From Week to Week

MR. WILLIAM PARK LYLE, of 9 Wyndham House, Sloane Gardens, Chelsea, late of Abram Lyle and Sons, left gross estate value £741,685 (net personalty £730,711).

A SCIENTIFIC EXHIBITION AND SOIREE, organised by the associated learned societies of Liverpool and district, will be held at the City Technical College, Byrom Street, Liverpool, on October 26. A large number of exhibits, demonstrations and lectures have been arranged.

A BOOKLET ENTITLED "CITIES WITHOUT SMOKE," which can be obtained free of charge on application to the publishers, The British Commercial Gas Association, 28 Grosvenor Gardens, London, S.W.1, states that if the 40,000,000 tons of coal consumed raw in domestic grates in this country last year could have been treated in the gas works, they would have yielded clean, labour-saving fuel in the form of 576,000 million cubic feet of gas; 28 million tons of coke and breeze; 400 million gallons of tar; 600 million gallons of crude liquor (source of sulphate and nitrate of ammonia, etc.).

CHINA CLAY WORKERS representing all branches of the Transport and General Workers' Union in Cornwall and Devon held a special meeting at Liskeard, when the following resolution was passed: "That this Conference, representing the China Clay branches of the Transport and General Workers' Union in Devon and Cornwall having considered the wages and conditions, at present prevailing in the industry, pledges itself to take every legitimate means to bring about an immediate improvement. Furthermore, we demand that the Federation of Employers enter into an immediate conference with the representatives of the Transport and General Workers' Union for the purpose of effecting an agreement for the improvement of wages and conditions in the industry.

A CONCENTRATED DRIVE against accidents will be made when some 7,000 delegates representing all parts of the United States and several foreign countries assemble at Louisville, Kentucky, to attend the sessions of the 24th Annual Safety Congress from October 14 to 18. While much attention will be focussed on street and highway traffic sessions, emphasis will also be placed on accident prevention in industrial plants of all kinds, in the home, in schools, in the air and at sea. Separate programmes have been arranged for industries in the individual sections, such as cement, chemical construction, mining, marine, meat packing, petroleum, public utilities, quarry, refrigeration, rubber, textile, wood products, automotive and machine shop, transit and others.

THAT THE FUTURE OF STAFF EMPLOYEES in the heavy engineering industry should be made secure is a problem exercising the minds of many large-scale producers in British Industry. In his speech made at the annual meeting on October 2, Mr. W. Benton Jones, chairman of the United Steel Companies, Ltd., showed how this is taking care of the future of its employees. A contributory life assurance and pensions scheme, for voluntary acceptance, has been inaugurated. The scheme is particularly interesting as it provides for not only the staff, from the junior typist to the highest paid official, but foremen and establishment men. It provides both annual retiring pensions for men at sixty-five years of age and for women at sixty, and life assurance of a substantial amount at any time up to pensionable age.

FURTHER DETAILS ARE NOW AVAILABLE regarding the proposed rayon factory in Longford County. The nominal capital proposed is £200,000 in shares of £1 each, of which 15s. only will be immediately called up. The initial production planned is 300,000 lbs. per annum. Fifteen per cent. of the capital is to be raised locally, and a financial firm will guarantee the remainder. Profits on a selling price of 3s. 6d. per lb. are estimated at £11,500. Working capital of £41,000 is allowed for, whilst the expenditure on buildings and equipment is put at £109,000. Application will be made to the Free State Government for the listing of rayon yarn as a "reserved commodity," and thus a complete monopoly would be obtained. It is understood that the patents used would be those of British Bemberg, Ltd., who will provide expert assistance and are to have one-third of the balance of profits distributed after the cash investors have received 5 per cent.

AT LEAST 20 PERSONS WERE KILLED and many injured, including a number of women, on Monday, by one of the worst explosions, followed by fire, which Chicago has ever known. The explosion, which occurred at the factory of the Glidden Soya Products Co., rocked the whole city for miles around. Three small buildings were destroyed, numerous cars in streets nearby were blown into the air and badly damaged; goods trucks in an adjoining siding were blown apart; thousands of windows in surrounding blocks were shattered; and pedestrians were thrown off their feet and suffered severe shock. The disaster occurred when a vat of soya bean mash, holding thousands of gallons of boiling liquid being subjected to high pressure, exploded. Fire immediately broke out, and in a few seconds the building was one mass of flames. So dense was the smoke that the exact building affected was at first thought to have been the factory of the Nubbian Varnish and Paint Co., which adjoins.

A COMPLIMENTARY LUNCHEON to Captain H. F. Crookshank, M.P., Minister for Mines, has been arranged by the Mining Institute of Scotland. He will meet the members of the Institute at a reception and luncheon which will be held at the Grosvenor Restaurant, Gordon Street, Glasgow, on October 19.

MR. J. L. WILSON GOODE, British Trade Commissioner at Vancouver, is at present in this country on an official visit. Mr. Wilson Goode will be available at the Department of Overseas Trade on October 21 for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Western Canada. In the meantime he is visiting a number of industrial centres in the provinces.

SIR JOHN SIMON, Home Secretary, Sir Robert Robertson, Government chemist, the presidents of all the principal chemical organisations, and representatives of a large number of firms engaged in the heavy chemical industry at home and abroad, have accepted invitations to a dinner at Imperial Chemical House next Thursday, to celebrate the centenary of the foundation of Chance and Hunt, Ltd., one of the most important subsidiaries of Imperial Chemical Industries, Ltd. Sir Harry McGowan will preside.

A HISTORICAL ACCOUNT of the inauguration and development of the gas supply of the city of Glasgow has been published by the Corporation's Gas Department. Provan, Dawsholm, Tradeston and Dalmarnock works are described in detail, and a special section is devoted to the plant at the chemical works, which adjoin each of the four gasworks and thus provide means for working up the tar and ammonia liquor obtained in the manufacture of gas.

AN OPTIMISTIC REPORT on the possibilities of developing the lucrative nickel mining in the Pilansberg area, forty miles north-west of Rustenburg, in the Transvaal, has been made by the Government Geological Survey Department. The report states that the deposits show a higher average production of nickel than the Sudbury deposits in Canada, which supply the world with 90 per cent. of its nickel supply. The Canadian deposits seem to be of the same nature and origin as the Pilansberg, though the Canadian pipes are wider. The future successful exploitation of the Pilansburg deposits depends upon whether a sufficiently large tonnage can be proved beyond the depths at present reached.

THE PROGRESS WHICH THE ST. AUSTELL GAS CO. has made in recent years has been remarkably illustrated by the opening of their new showrooms in Church Street, a ceremony performed by Sir Francis Goodenough, chairman of the British Commercial Gas Association. In declaring the showrooms opened Sir Francis congratulated the St. Austell Gas Co. on their enterprise and also the architect on the very effective way the scheme had been carried out. He was pleased that St. Austell was following the footsteps of other gas undertakings in the West. The premises will contribute to the architectural as well as the commercial advancement of the town and are sure to meet a long-felt want. Mr. S. J. Ingram, chairman of the South Western Gas Corporation, who presided, traced the history of the company to its present position.

A NEW COMPANY known as the Chemical Industrial and Pharmaceutical Laboratories, Ltd., has been registered in Bombay with a capital of £45,000 for the manufacture and sale of chemical and pharmaceutical products, including latest medicinal specialities and toilet requisites, and for producing indigenous medicinal products on the modern western system. In the prospectus issued by the company, it is stated that the scope for the industry in India is very large as the total annual imports of such products easily amount to over £4,000,000 in value. It is expected that the company will be able to make good profits and declare dividends of 25 per cent. or so. The managing director is Dr. K. A. Hamied who holds German degrees in science and has already made a name as a business man in Bombay and as a manager of the Okassa Co. (Berlin) India, Ltd.

THE DOMINION FUEL BOARD at Ottawa has issued an interesting chart illustrating the supply and distribution of coal in Canada, containing also data relative to imports from the United States, Great Britain and other countries during the ten years 1925-1934. The chart shows the remarkable extent to which Canada's coal supply has now been diverted from the United States to Great Britain, particularly so far as imported anthracite is concerned. For instance, in 1925, Canada produced 13,134,968 tons of bituminous coal; in 1934, a total of 13,795,649 tons—a considerable reduction as compared with the figure for 1928, which is given as 17,564,293 tons. Imports of bituminous coal from Great Britain during the ten years advanced from 56,822 tons to 331,517 tons, whilst imports from the United States declined from 12,976,133 tons to 9,944,162 tons. At the same time, imports from Great Britain of anthracite increased threefold from 549,247 tons to 1,643,516 tons, coincidently with a reduction in imports from the United States by half, from 3,249,497 tons to 1,804,127 tons. Imports of anthracite from countries other than Great Britain and United States last year totalled 89,666 tons.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BERGER (PARIS) PRODUCTS, LTD., Brighton, mfrs. of disinfectants, etc. (M., 12/10/35.) Reg. Sept. 30, £1,300 deb., to Sibyl M. G. Lloyd, 2x Harbour Cottages, Bosham; gen. charge.

BRITISH EMULSIFIERS, LTD., Teddington. (M., 12/10/35). Reg. Sept. 28. £10,000 deb. stock secured by Trust Deed dated Sept. 27, 1935; general charge (excluding leasehold properties). *——. Dec. 26, 1934.

HAWKER AND BOTWOOD, LTD., London, E., chemical mfrs. (M., 12/10/35.) Reg. Sept. 26, £10,000 deb. to Branch Nominees, Ltd., 15 Bishopsgate, E.C.; gen. charge. *Nil. Dec. 1, 1934.

VISCO ENGINEERING CO., LTD., Croydon. (M., 12/10/35.) Reg. Sept. 28, £9,000 1st deb., to Westminster Bank, Ltd.; general charge. *£9,000. Mar. 15, 1935.

Satisfactions

NORTH BRITISH ALUMINIUM CO., LTD., London, E.C. (M.S., 12/10/35.) Satisfaction reg. Sept. 26, of Trust Deed reg. Feb. 23.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

M. S. & G., LTD. (trading as COAL DISTILLATION PLANT), 52 Queen Victoria Street, E.C., coal distillers. (C.C., 12/10/35.) £11 15s. 10d. Aug. 28.

Partnership Dissolved

NEGRETTI AND ZAMBRA. (P.D., 12/10/35.) Marcus William Zambra will retire from the partnership subsisting between Henry Noël Negretti, Paul Ernest Negretti and Marcus William Zambra, scientific instrument manufacturers and export merchants, 38 Holborn Viaduct, London, 122 Regent Street, London, and Half Moon Works, Barnsbury, London, from October 1, 1935. In future the business will be carried on by Henry Noël Negretti and Paul Ernest Negretti.

Forthcoming Events

LONDON.

Oct. 14.—Institution of the Rubber Industry (London Section). "Review of Rubber Footwear." D. Baptie. 7.30 pm. 12 St. James's Square, London.

Oct. 15.—Society of Chemical Industry (Plastics Group). "What the Architect Requires of Plastic Materials." Grey Wornum. 8 p.m. Burlington House, Piccadilly, London.

Oct. 17.—The Chemical Society. Ordinary scientific meeting. 8 p.m. Burlington House, London.

Oct. 18.—Electrodepositors' Technical Society. Soiree in connection with the Electrodeposition Exhibition. 6 p.m. Science Museum, South Kensington, London.

Oct. 18.—British Association of Chemists (London Section). Smoking Concert. 7.45 p.m. Broad Street Station Restaurant, London.

BIRMINGHAM.

Oct. 17.—Institute of Vitreous Enamellers. (Midland Section). "The Development of a Continuous Vitreous Enamelling Furnace." W. Marshall. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

BRISTOL.

Oct. 14.—University of Bristol. Recent Advances in Catalysis. Dr. E. B. Maxted. Lecture I. Catalytic Activation. 5.15 p.m. University, Bristol.

DERBY.

Oct. 15.—Society of Dyers and Colourists (Midland Section). "Suggestions for the Dyeing and Finishing of Bemberg Silk." Mr. Higgs. Derby Technical College.

EDINBURGH.

Oct. 15.—Institution of the Rubber Industry (Scottish Section). Annual general meeting 7 p.m. "The Manufacture of Tyres." John Young. 7.30 p.m. Chamber of Commerce Rooms, Edinburgh.

GLASGOW.

Oct. 14.—Institute of Metals (Scottish Section). Works Visit. Messrs. Henry Wiggin and Co., Ltd., Zenith Works, Thornliebank, Glasgow.

Oct. 18.—Institute of Chemistry (Glasgow Section). Annual general meeting. 7.30 p.m. Exhibition of Technical Books. 8 p.m. Institution of Engineers and Shipbuilders, Glasgow.

HUDDERSFIELD.

Oct. 15.—Society of Dyers and Colourists (Huddersfield Section). "Contrasts in Colour Manufacture, Past, Present, and Future." Huddersfield.

HULL.

Oct. 15.—Hull Chemical and Engineering Society. "Some Aspects of Painting Technique in the Light of Modern Knowledge." Dr. J. O. Cutter. 7.45 p.m. Municipal Technical College, Park Street, Hull.

LEEDS.

Oct. 14.—The Chemical Society. "The Fat-soluble Pigments of Nature." Professor I. M. Heilbron. 7 p.m. New Chemistry Theatre, The University, Leeds.

LIVERPOOL.

Oct. 18.—The Chemical Society. "Some Recent Advances in Stereochemistry." Dr. W. Wardlaw. 6 p.m. University, Liverpool.

MANCHESTER.

Oct. 16.—Manchester Metallurgical Society. Presidential Address. L. E. Benson. 7 p.m. Engineers' Club, Albert Square, Manchester.

Oct. 18.—Society of Dyers and Colourists (Manchester Section). Symposium: "Azoic Colours." 7 p.m. 36 George Street, Manchester.

NEWCASTLE-ON-TYNE.

Oct. 18.—The Chemical Society. Joint meeting with the Society of Chemical Industry. 7.30 p.m. Chemistry Lecture Theatre. Armstrong College, Newcastle-on-Tyne.

SHEFFIELD.

Oct. 15 and **16.**—Society of Glass Technology. Sheffield.

STOKE-ON-TRENT.

Oct. 14.—The Ceramic Society (Pottery Section). "The Selection of Lubricants for Industrial Purposes." F. J. Slee. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

WORKINGTON.

Oct. 18.—The West Cumberland Society of Chemists and Engineers. "The Fuel Research Coal Survey." Dr. John H. Jones. 7 p.m. Workington.

Company News

Burt, Boulton and Haywood.—The directors announce a dividend of 2 per cent., less tax, for the year to June 30 last. This makes a total of 4 per cent. for the year in comparison with 5 per cent. a year ago.

Borax Consolidated, Ltd.—It is announced that consideration of a dividend on the 6 per cent. preferred ordinary shares is postponed until after the completion of the year's account. This is in accordance with the policy announced at the annual meeting last February, when it was stated that until business became more normal the board considered it advisable to take this course.

Anglo-Continental Guano Works.—A net profit for the year to June 30, after charging debenture interest, £13,750, of £59,187 is reported. The directors propose to pay a dividend of 7½ per cent. on the ordinary, less tax, absorbing £11,625, to set aside £3,750 (same) for debenture sinking fund, to transfer to depreciation reserve £5,000 (same) and to reserve £5,000 (bringing this fund up to £60,000), against £8,017, carrying forward £42,932.

New Companies Registered

Kenok Products, Ltd., 11-12 Finsbury Square, E.C.2.—Registered October 3. Nominal capital £200. Manufacturers of and dealers in metals, minerals, wood, paper, pulp, fibre, skins, wool, leather, textiles, glass, oils, drugs, chemicals, etc. A subscriber: S. Bregman.

G. C. Russell, Ltd., 55 Hanger Lane, Ealing, W.5.—Registered October 7. Nominal capital £5,000. Collectors, manufacturers and merchants of and dealers in fats and bones of all kinds, glue, gelatine, fertiliser and grease and bone, fat and grease by-products, etc. A subscriber: Frank Bass.

Mouldcraft, Ltd., 55 Spital Street, Dartford, Kent.—Registered October 3. Nominal capital £5,000. To manufacture, buy, sell and deal in organic and inorganic chemical substances, and products, natural or synthetic plastics, bakelite and plastic mouldings, etc. Directors: Reginald B. Smith, Henry H. Prall, Hugh Goff.

TENDERS

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

CITY OF WAKEFIELD.
SEWAGE CHLORINATION PLANT.

The Corporation invite tenders for the supply, delivery and erection at Calder Vale Sewage Disposal Works of a CHLORINATOR of a capacity of 300 lbs. of Chlorine per 24 hours.

The price is to include all necessary pipework, valves and other equipment.

The value of all necessary spares is to be set against each item.

The tender must be accompanied by a complete specification.

Tenders must be delivered to the undersigned not later than 19th October, 1935.

No tender will be considered except in a plain, sealed envelope, which must be endorsed "Tender for Chlorinator," but shall not bear any name or mark indicating the sender.

The lowest or any tender will not necessarily be accepted, nor will any allowance be made for tenders.

T. NICHOLAS GRIMSHAW,
Town Clerk.

Town Tall,
Wakefield.
October, 1935.

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